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THE RESOURCES OF THE EMPIRE

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THE RESOURCES OF THE EMPIRE SERIES

COMMUNICATIONS

BY

W. TETLEY STEPHENSON
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WITH A FOREWORD
BY
H.R.H. THE PRINCE OF WALES, K.G.

AND GENERAL INTRODUCTIONS
BY
THE RT. HON. SIR ERIC GEDDES, G.C.B.
(President of the Federation of British Industries)
AND
SIR FREDERICK W. LEWIS, BART.
(Chairman of Furness, Withy & Co., Ltd., ex-President of the Chamber of Shipping)

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FOREWORD

BY

H.R.H. THE PRINCE OF WALES, K.G.

No business man—especially should he contemplate an extension of activities—can afford to dispense with periodical stocktaking. The necessity for this applies equally to a country or empire, particularly when recovering from a devastating war that has resulted in heavy liabilities and dislocated the accustomed routine of trade and commerce. We are all proud of the British Empire, embracing more than a quarter of the world's land area and a similar proportion of its inhabitants, but very many of us fail to realize the infinite variety and vast extent of the Empire's natural products, which are capable of being made self-sufficing.

The volumes of this Series pass in review the material resources of the Empire, and constitute—as it were—an imperial stocktaking. They deal with food and raw materials of every kind, summarize the present condition of inter-imperial trade, and indicate where further developments are possible.

At the present moment, when our great British Empire Exhibition is imminent, they should be of special interest both at home and overseas. It gives me great pleasure to recommend them to all those who have at heart the proper organization of the Empire's natural wealth.

Edward P.

GENERAL INTRODUCTION

BY

THE RIGHT HON. SIR ERIC GEDDES, G.C.B.

In undertaking the preparation of this Series the Federation of British Industries has, I am convinced, rendered a really practical service to business men throughout the Empire.

Hitherto there has been no standard work of reference giving the information which ought to be in the possession of business men all over the world regarding the resources of Great Britain and the other countries of the Empire in the materials of industry.

It is true that there are some excellent monographs describing in general terms the resources of isolated parts of the Empire, and a very few dealing comprehensively with individual products, but, apart altogether from the fact that the sum total of the information contained in existing publications falls hopelessly far short of what is requisite, such information as exists is hardly prepared in a form adapted to the requirements of the practical man who wants neither a bare table of statistics about the products essential to him in his business nor a mere general description of the extent of the resources of a given country in those products. On the contrary, the business man wants information, not only as to the available supplies of his raw materials, but as to the quality of the supplies produced in different parts of the world, as to the amount of the undeveloped resources, as to the transport facilities, as to the local conditions of labour, etc., and as to the chances of present supplies available for import in this country being absorbed in the near future by local demands. In other words, he wants particulars of all those factors which have to be taken into account in the ordinary course of business, and he wants those particulars arranged in an accessible form.

The aim of this Series has been to give this information in this form, and thus to provide not only for our own use, but for the use of traders all over the world a compendious Buyers' Guide to our Imperial resources. I venture to think that the present is a very appropriate time for this undertaking. It is not only that all our thoughts are being turned towards the idea of Empire Trade and Empire Development by the great Exhibition which is shortly to be opened and which will be the most impressive demonstration of our Imperial productiveness that the world has yet seen. The whole trend of economic circumstances is forcing us in the same direction.

The world war has disastrously affected the Continent of Europe as a market for the manufactured goods of Great Britain and the products of the British Dominions. Even foreign countries which were neutral in the great struggle have suffered in the same way, though in a less degree. Our trade with the

Far East and South America has suffered serious diminution, and though more than five years have now elapsed since the cessation of hostilities, the resumption of normal conditions seems but little nearer. Moreover foreign tariffs are rising higher and higher against us all over the world. Meanwhile our own productive capacity has been substantially increased and our population has grown to such an extent that we have now two million more mouths to feed and a million more men to employ than we had in 1914. It seems clear, therefore, that we need some reorientation of our commercial policy, and the obvious direction for this seems to be the cultivation of our own inheritance. A study of the facts shows that there is good hope in such a policy. Britons in all parts of the world are bound together by ties of sentiment and custom which neither distance nor difference of conditions can seriously weaken. Not only has the tremendous investment of British money in our Overseas Dominions bound us with a golden chain, there are a thousand invisible impulses always strengthening the bond. Even in 1913 our trade with the Empire was about 25 per cent (Imports) and 36 per cent (Exports) of our total world trade. The following tables show this in more detail with a comparison with the figures for the latest twelve months available. From these it will be seen that our Imports from Imperial sources show a substantial advance over pre-War, the Export figures remaining about the same.

PERCENTAGES OF IMPORTS FROM VARIOUS SOURCES

Consigned from	Oct. 1922 to Sept. 1923.	Year 1913.
British-India	6·0	6·3
Self-governing Dominions	16·3	13·3
Other British Countries (except Hong-Kong)	5·3	5·3
Europe	33·2	40·4
United States	19·6	18·4
South and Central America	10·8	10·0
Other Countries	8·8	6·3

PERCENTAGES OF EXPORTS (U.K. GOODS) TO VARIOUS DESTINATIONS

Consigned to	Oct. 1922 to Sept. 1923.	Year 1913.
British-India	12·2	13·4
Self-governing Dominions	18·0	17·5
Other British Countries (except Hong-Kong)	5·7	5·4
Europe	34·2	34·4
United States	8·0	5·6
South and Central America	8·8	10·6
Other Countries	13·1	13·1

The following table shows the areas and populations of the British Territories on the various Continents :

Summary of Area and Population (1921–22)

	Area sq. miles.	Population.
Great Britain and Ireland	121,633	47,308,000
Europe	120	234,000
Asia	2,123,418	332,772,000
Africa	3,822,667	50,119,000
America	4,009,996	11,142,000
Australasia	3,278,917	7,795,000
	13,356,751	449,370,000

The following table shows the approximate purchases of British goods per head of population for the first three quarters of 1923:

	£ per head.
India, British	0·2
Federated Malay States	0·5
Australia	7·8
New Zealand	12·3
Canada	2·3
Hong-Kong	7·7
Union of South Africa	2·1

The most striking features here are the huge acreage, small population, and large volume of purchase per head of Australasia and the relatively huge populations and small volume of purchases in the Eastern territories, with Canada and South Africa occupying an intermediate position. I will recur to this contrast later.

Finally a few figures may be given indicative of the percentage of various important world supplies either produced or available within the Empire:

	1915.	1921.
Copper (long tons)	100,000	46,000
Percentage of world production	10·2	8·5
Lead (long tons)	—	199,400
Percentage of world production	—	22·9
Tin Ore (long tons)	68,300	46,800
Percentage of world production	53·9	42·2
	1913.	1923.
Wool, including alpaca, etc. (lbs.)	5,414,067	14,077,339
Percentage of world production	74·6	77·1

It is clear, therefore, that there is an almost unlimited field for expansion of our Empire trade; whilst in many lines this possibility of a self-supporting Empire should be realizable. On the side of Great Britain the requisite Productive power already exists. Overseas the position is somewhat different, and it seems clear that the requisite development of the purchasing power of the Overseas Dominions can only be produced by a gradual development of the resources of those Dominions, the surest way to which will be an increase in our own consumption of their products. There are two distinct problems, one for the tropical and one for the temperate and sub-tropical countries.

In the former any substantial increase in the white population is hardly to be expected, since the bulk of the work of the country must in such climates always be done by the native races. The purchasing power of these territories can therefore only be developed by the steady development of their material resources. This, of course, means recourse to British capital, if Great Britain is to get the greatest advantage from the development and if our Imperial ideal is to be fulfilled. In our present economic condition this, of course, presents some difficulty, but if we can carry out this programme, there will follow a greater demand for British plant, machinery, shipping, rolling stock, etc., as well as a gradual increase in the consuming power of the natives.

In the temperate climates the quickest means to both our objectives lie in the speedy increase of the white populations. Nothing is more striking in the figures given above than the quantity of British goods purchased per head of these great peoples. But it is useless to attempt to stimulate emigration from this country to the Dominions unless there is a real demand for the services of the migrants when they arrive. Such a demand will only arise *pari passu* with the development of the resources of the country concerned.

The deduction to be drawn from the above considerations is obvious. How the required results are to be pursued is a more difficult question. This is not the place, nor am I the person, to embark on questions of political controversy. I will only point out that whatever method be adopted, accurate and comprehensive knowledge of the facts is absolutely essential. (All those who are engaged in business, either here or overseas, whether it be in finance, in production, in merchanting, in transport or in insurance, should be informed of what the different parts of our great Empire can produce, and the conditions under which production must take place and those under which the produce can be brought to market. There should be a general knowledge, too, of the amount of foreign competition, with which our products and materials have to contend.)

In all my experience, whether on the railways, in the turmoil of the Great War, in Government, or in commerce, I have been continually impressed with the vital importance of accurate and comprehensive statistical knowledge—and, I am afraid, too often impressed with the difficulty of getting it.

This Series is an endeavour to supply such information regarding our Imperial Resources. It cannot, unfortunately, be maintained that the results are in every case all that one could wish. However, this very inadequacy is perhaps the clearest justification for the Series. The fact that complete information cannot be given shows how necessary it is that all available information should be collected and made public. Only in this way can attention be called to what is wanting and the deficiencies made good. If the Series proves as successful as I hope it may and believe that it will, it should become a permanent institution, and it should be possible gradually to make good what is now wanting in future issues, so that eventually we may have in it a standard work of reference, which should be indispensable to all those interested or engaged in Imperial commerce or development, whether he be business man, student, or administrator.

Eric Geddes

March, 1924.

INTRODUCTORY REVIEW

BY

SIR FREDERICK W. LEWIS, BART.

It was a happy inspiration that this series of books, dealing with the resources of the British Empire, should close with a volume on Communications. Great as the natural resources of the Empire are, most of them would be of little worth without the means of transport, which were developed to such a high stage of efficiency in the nineteenth century. It was these means of transport combined with the telegraph and the cable which brought about the substitution of a world economy for a national economy. Trade within the Empire belongs to the former rather than the latter class. It is doubtful whether there is a product in the world, which could not be produced, and that under favourable conditions, in some quarter of the Empire. It might be said that the history of the development of the Imperial resources would be very largely a history of the development of the means of communication.

In every important phase of British history our Merchant Marine has played an important part and, therefore, as a shipowner, I am pleased to see that shipping has been given the most prominent place in the book. Whilst shipping has not developed the speeds of inland transport, it is capable of providing transport at a lower cost than any of the other means. It is not by accident that Britain possesses the most powerful Mercantile Marine in the world. There are two reasons for it, one perhaps the collatory of the other, viz. that we live in an island home and secondly that our race is by instinct an adventurous and sea-loving race. As a result, and because of the efficiency of management and operation, the British Mercantile Marine is still, in spite of the changes consequent upon the War, generally recognised as the world's common carrier by sea. When the distances of the British Empire are considered, it is clear that low transport costs are absolutely vital if cheap and bulky commodities like grain, when produced in the most distant of our Dominions and Colonies, are to be able to compete in the markets of the Mother Country. The possibility that transport by air may supplant shipping in the carriage of mails, and of the passengers desiring a high-speed service, is one which, for the time being at any rate, need cause the shipowner no alarm, and should be welcomed from the Imperial standpoint. As Sir Alan Anderson has pointed out in his contribution to the work, higher speeds for ships cost more than they are worth commercially. The loss of traffic to the air transport would represent only a small portion of the cargoes, and would be likely to be much more than made good by increased trade resulting from the speeding up of communications. Each improvement in speed is equivalent to reducing the distances which separate us from the Dominions and Colonies, and these units from one another.

The requirement of cheap and rapid transport within the Empire is so important that every one must welcome the attention paid to it at the Imperial Economic Conference last year. It is only by co-ordination that our resources can be developed to a maximum, and waste avoided. Shipping has been assisted in this matter by the Imperial Shipping Committee, a body which has won the respect and goodwill of shipowners and shippers alike. The value of the work done by that Committee has been the greater because the British shipowner has to face keen competition. The position in that respect has not been rendered easier by the incursion of Governments into the field, and private enterprise has every reason to welcome the inquiries made by the Committee with a view to ensuring that the competition is conducted fairly and on an equitable basis. This Committee may in some ways be taken as a model. There is room for Committees of a similar kind in connection with air-transport, and with other means of communication like the cables and wireless. Further, as Mr. Stephenson points out, the means of communication between the various units which form the Empire, inevitably raise international problems. These problems we want settled not in the interest of Canada, or Australia, or Great Britain, but in the way which will be best for the Empire as a whole. It is desirable that in the councils of the world the Empire should show a united front, and co-ordinating bodies like the Imperial Shipping Committee can render a great service in bringing this about.

Though the means of communication which link the United Kingdom, the Overseas Dominions, India, and the Colonies together, naturally appeal first, when communications of the Empire are in question, the internal communications are not less important. So far as it is consistent with local freedom in development, it is undoubtedly in the interest of Imperial trade that whenever possible common standards should be adopted.

We would in conclusion welcome this book as the first book of its kind. Hitherto it has been necessary to consult a series of statements, year books, and similar works of reference to gain any knowledge of the means of communication in the different parts of the Empire. To attempt to bring the various means together in one volume was a task of great difficulty, and it has necessarily meant the omission of much that we could have wished to have seen included, notably the omission of the Crown Colonies. Still it is a great step forward to win such a recognition of the importance of communications. Perhaps, when the series comes to be revised next, two volumes might be allotted and then communications will not be receiving more than, if as much as, the share of space due to their importance in the Empire's economy.

FREDERICK W. LEWIS.

March, 1924.

PREFACE

THE author of this work is very conscious of many defects in it. Not only has the time available been very short, but the desire that the whole series, of which this is the last volume, should be issued before the opening of the Wembley Exhibition, has prevented any material revision of any part of the book. To deal with so many means of communication in one volume meant that much had to be omitted. The work of selection of matter to be included was in itself a task of no mean difficulty, and there is room for much difference of opinion as to what should be included and what omitted.

The reader is asked to bear in mind that in some of the means of communication history is being made so rapidly, that it is almost impossible to be up to date. Whilst the final proof-sheets were in course of correction, the report of the " Donald " Committee on " Wireless " appeared, but all that was possible was to insert a footnote directing attention to it. It is quite likely that, before this meets the reader's eye, the Government will have declared their intention with regard to the immediate future of the air-ship, and the Burney scheme.

In conclusion, the author would wish to express his deep indebtedness to Sir Alan Anderson, who has contributed a short chapter on Overseas Mails by Air and Ship, and to the contributor of the chapter on Air Transport, whose name he is not permitted to mention. He has also to acknowledge the very valuable assistance rendered to him by the Eastern Telegraph Company, and the Marconi Wireless Company in connection with the chapters on Communication by Cable and Wireless respectively. His thanks are also due to the representatives of the Overseas Dominions, who have frequently taken much trouble to obtain information needed ; whilst to many of his colleagues at the London School of Economics he is under obligation, but more especially to Professor Knowles and Professor Sargent, who have done so much to place transport in its true perspective as the result of their investigations into Economic History and Commerce.

W. TETLEY STEPHENSON.

March, 1924.

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COMMUNICATIONS

CHAPTER I

INTRODUCTORY

PERHAPS the feature which most distinguishes the British Empire from all the great empires that have preceded it, is the way in which it is scattered. It was this characteristic which led General Smuts to declare at the first meeting of the Economic Conference (1923) that "communications are of the essence of our Empire, and unless we succeed in solving some of the most urgent problems of more rapid and cheaper communications it will be almost impossible in the future to hold together this vast Empire scattered over the whole globe." This statement applies not only to the movement of persons and goods, but also to those other means of communication by post, telegraph, and telephone which constitute such an important part of the means of conducting business and distributing information. Rapidity and cheapness are as important for the latter as the former. The need for rapidity is universally recognised. It is easier to overlook that the small sums charged for a letter or a word in a telegram, when multiplied by the large numbers which measure a firm's correspondence or the words contained in its telegrams, amount to big sums in the course of a year. To the Press, which collects and distributes so much of the news on which the business world relies, cheapness is particularly vital.

In the past it has been usual to find trade written of as mainly a matter of production, and the exchanges. Transport is, however, the predominant factor in trade. The exchange of commodities implies a change of place. The change of place is effected by some means of transport, be it ship, train, road vehicle, aircraft, or the most primitive means of carriage by animal or man. In the days when local communities were largely self-sufficing, the amount of transport required was comparatively small, and, except for short distances, the transport was almost entirely engaged on the carriage of luxuries. For centuries this state of affairs remained almost unchanged. But with the Industrial Revolution, railways came into being and the steamship was substituted for the sailing vessel. This revolution in the means of transport first rendered a complete national system of trade possible, and soon led to the substitution of an international for a national economy. The nations are now linked together into a common economic system. No country can now stand apart. Great land or sea empires have developed which now dominate the major portion of the world. This world economy can be said to date from about 1870, by which time railways and steamships had been developed in

Great Britain, Western Europe, and the United States to a stage when their means of transport can be described as revolutionised. Twenty years later Russia could be added to the list.

The power to move bulky and heavy goods in large quantities over great distances was a direct outcome of the construction of railways and the introduction of steamships. Not only could such goods be moved, but they could be moved at such low costs that the goods might be in themselves of quite low value. This meant a revolution in the chief staples of commerce. Bulky and perishable articles come to take the foremost place.

The modern organisation of production is equally dependent on the changed means of transport. Mass production depends on transport to bring together the materials needed, and the supplies for the workers. Even more it depends on transport for the distribution of the product. The greater the amount of the product, the greater must the market be. Unless a sufficiently large market can be reached, it is worse than useless to produce on the greatest scale. At the same time so great are the economies which result from mass production, that considerable sums can be paid away for transport, and still the commodity can be sold at a price below the cost price of the same commodity produced near to the market but in smaller quantities. The Ford motor-car is one of the most striking examples of this. Hours of work, rates of wages, the rate of exchange, the cost of transport are all operating disadvantageously, and yet, with a tariff to hinder the importation of foreign cars, and the high horse-power duty operating against the Ford car, this is sold in Great Britain in large numbers.

The ease and cheapness with which goods are transported have led many nations to erect tariff walls to protect their industries against those produced under more favourable conditions in other countries. This has resulted in British goods being severely hampered in their entry into many foreign countries, whilst under "free trade" our market was open. Under these conditions certain industries in this country became practically extinct. When the Great War broke out a serious, almost, it might be said, a dangerous condition was revealed. As the outcome two movements have developed. On the one hand, a system of protection for key industries has been introduced. On the other hand, a growing demand has arisen for development of trade within the Empire as the backbone of our overseas trade. Great increases in the production of raw materials and foodstuffs in the Overseas Dominions and Colonies are essential for the effective carrying out of this policy. Many raw materials and foodstuffs will only be produced if transport is good and cheap. They could doubtless be moved if transport was dear, but for the most part they would not be moved, because the high price to be paid for transport would be more than the prospective customers would be willing or could afford to pay.

Railways have been effective in opening up large areas for the production of wheat and corn, but considerable extensions of the railway system of the British Empire will be necessary if we are to depend on the Empire for our food supplies. In Western Canada the railway must come as close as thirty miles to the wheatfield, for that distance seems to be the practical limit of haulage by the farmers' horses and wagons, even over the level tracks of Western Canada. Beyond the thirty miles from the railway, the prairie is still unbroken and of value only for the pasturage of animals. In West and East Africa, much labour is still absorbed in porterage. Railways must be extended to set free this labour for agricultural developments, such as cotton in Uganda, and cocoa in West Africa.

Important as the railways have been and will doubtless continue to be in opening up the British Overseas Empire, the first line of communication is by sea. In shipbuilding and the carriage of goods by sea, the United Kingdom has been supreme. All parts of the Empire are connected with one another by good sea communications. Representative statesmen of the Overseas Dominions, and the outlying parts of the Empire are now able to come to the Mother Country for periodic conferences. Distance still remains a barrier, though the barrier is much less formidable than in years gone by. The betterment of the sea routes within the Empire was recognised by the Dominions Commission of 1917 as the best means of stimulating Imperial trade. "So long as freights are cheaper and means of communication between the Mother Country and the Dominions overseas, and between the Dominions themselves better than between foreign countries and the Dominions, so long will trade naturally follow Imperial channels." The Imperial Shipping Committee was a natural outcome of this view. Formed to examine shipping questions from the standpoint of the Empire, it reports not to Parliament or a Government Department, but to the Prime Ministers of the Overseas Dominions as well as of Great Britain. Shipping has brought into being the first regular piece of Imperial governmental machinery.

Just as tariffs have interfered with the freedom of trade, so do we find subsidies interfering with the natural developments of shipping and with the directions of trade movement. The subsidies have taken various forms. Often they have formed part of the consideration for the carriage of the mails. In this way, and in this way only, has it been found possible to ensure a service of the frequency and speed required. Other countries have not hesitated indirectly to subsidise their shipbuilding and shipping industries by means of preferential railway rates for shipbuilding materials, and for goods carried by ships on certain routes flying the country's flag. Lately the position has been still further complicated by state ownership and operation of a fleet of steamers, as in the case of Australia. The credit of the country is then pledged for the capital and annual expenses. If it is deemed in the interest of the country and its trade to carry on the business of shipping at a loss, such a policy can be followed, the loss being made good out of the national revenue.

This is somewhat of a new position in shipping, though it is one to which the world is quite accustomed in other forms of transport. Theoretically every country desires that its railway system should be worked so that it should not be a burden on the national finances. At the same time it is universally accepted that railways a country must have. If the railways can be made to pay their own way, so much the better. If they cannot, then the deficiencies must be met by taxation, but the railways must be built. The canals of the Continent

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have been kept in a false state of prosperity, have been largely kept alive by a policy of subsidy and protection. On few of them could freight rates have been charged any lower than the railway rates, if the traffic had been required to provide for the current expenses of operation and maintenance with a profit over to remunerate the capital. Rightly or wrongly the various Governments have decided to keep this less efficient means of transport in existence as part of the national system of inland transport.

Road transport stands in a similar position. The roads are provided almost entirely out of national and local taxation, a system which worked well when the traffic was very local in its character. The development of the motor vehicle has completely altered this. Road transport is no longer entirely of local traffic, but is very largely of through traffic. The local taxation instead of distributing the burden of road provision and maintenance between those who reaped the benefit of the roads as either users or customers of the users, now frequently throws the burden on persons who use the roads little and reap small advantage from the use made of them by others. The outcome has been an attempt to reimpose a part of the road costs on users as such by means of substantial licence duties on motor vehicles. The position still remains that road transport is subsidised through the road. Where railway transport receives no similar subsidy, as is the case in this country, an uneconomic distribution of the traffic inevitably results. Lower rates will be charged for some traffic when conveyed by road than will be charged for the same traffic by railway, whereas if the traffic when carried by road had to bear the full road-costs, the charge by road would be higher than by railway. In the absence of one form of transport giving advantages over the other form sufficient to outweigh the differences in charges, there is a diversion of traffic due to a lower charge to the user, but resulting in a higher total cost to the community as a whole.

The question of the subsidising of transport thus raises a number of considerations. There is the question of the preservation of alternative means of transport. Has the policy of the United Kingdom in allowing its canal system to dwindle and decay as the outcome of railway competition been commercially sound, or have the Continental countries, which have poured millions into their canal systems without any direct return, followed the economically sounder policy? This is the question which demands an answer in connection with our roads at the present day. Then there is the question of whether the user should pay such charges as will completely provide for the means of transport, or whether part of the costs should be borne by national or local revenues? This can be answered in general terms without any difficulty. Development of a country depends upon adequate means of transport. If the traffic cannot pay charges which will provide all the costs, but the value of the development of the area served and the resultant gain to the rest of the country is materially greater than the deficiency to be made good, then these increased values may reasonably be drawn upon to make good the deficiency.

The problem becomes more difficult when the question is asked—Should increased values generally or even always be called upon to contribute a part of the increase to the provision of the means of transport? Theoretically there is much that could be said in favour of an affirmative answer. In practice there are immense difficulties in the assessment and collection of any such contribution. Docks furnish the case in which the increased values are most frequently drawn upon. In Great Britain, the largest dock owners are the railway companies. In 1922, a year which gives an exceptionally favourable result, the railway returns show that the capital invested in railway-owned docks amounted to £53,047,000, whilst the net revenue amounted to £1,753,000, or 3·3 per cent on the capital. The deficiency of interest on the capital is made up from the railway earnings on the additional traffic which comes through the existence of a modern well-equipped port on the system. The arrangement is good for the port and good for the railway company. Other docks are owned by municipalities. These do not on the average show a better financial result than the railway-owned docks. The deficiencies are made good out of a local rate, which may be considered as a contribution from the increased prosperity accruing to the town through the existence of the docks, which bring trade and business in a variety of ways to the town. Very few of the docks and ports of the United Kingdom can pay their way and provide a reasonable return on the capital invested out of the payments made in dues, tolls, rents, etc., though amongst the few can be numbered the largest.

The weakness of the British system is that a contribution to the dock deficiency is obtained from only one of the indirect beneficiaries. On the Continent of Europe it is not uncommon to find all the beneficiaries required to take a share in the risk of a deficiency in the dock revenue. The docks are looked on as the gateways of trade, and the wider the gateways are kept open the better for the trade of the country. The charges must be kept at a level which will not hinder the traffic from flowing freely. From the increased trade thus encouraged the local commercial community get the first benefit, so they are required to find a portion of the capital. The municipality obviously is a gainer, and so is required to provide a portion. The railways, many manufacturers and other producers, merchants, and consumers in the hinterland benefit. On the Continent the railways are frequently State-owned, so that the whole of these are represented by the State, which provides the balance of the capital. In this way dock charges are kept moderate, and if any deficiency occurs it is well spread over all the interests that benefit from the existence of well-equipped ports and docks. The ports and docks are rarely allowed to suffer for any length of time from inefficient or out-of-date equipment.

When the communications of the Empire are under consideration it is well worth while to take into consideration the Continental dock practice. Unassisted private enterprise has done wonders, but it is at least doubtful whether it can continue indefinitely to maintain its pride of place against subsidised or State undertakings not required to pay their way. Apart from any effects of international competition, the demand for cheapness in the communications between the most distant parts of the Empire may be such that the degree of cheapness required can only be attained if the traffic is charged less than the complete costs of the service. The benefit to the Empire from the additional trade between two of its units may be so much greater than if the same trade were done between one unit and a foreign country that it will more than compensate for the difference.

Leaving the problems of cheapness of communications for the present, the problems of reducing the journey times next attract attention. It is only by greater frequency of service, and higher speeds being obtained on the journeys that persons and goods may be carried between distant parts of the Empire with less disadvantage than now exists. Each reduction in the journey time is equivalent to a reduction in the distance. London and Paris are for business purposes nearer together now that it is possible to attend to urgent correspondence in the office, fly to Paris, conduct business personally there, and fly back all in the same day. Between the main units of the Empire the great distances are bridged by sea transport. In recent times the growth in traffic has been paralleled by a growth in the size of ships. The greater frequency of service, which would naturally have followed the growth in traffic, has been largely offset. Increases in speed are very costly, as the cost increases much more rapidly than the rate of increase in speed. That much higher speeds can be obtained in sea-craft is shown by the speeds attained by various types of ship in the Royal Navy. They are, however, commercially impracticable. Nor is there any sign that any great advance in the near future is probable, though no one can foretell what the march of science may produce.

There is, however, a new means of transport in process of development which may do much to reduce the great distances which separate the Dominions and Colonies from the Mother Country and from one another. Transport by air is being conducted at speeds which have been but a dream for any previously known means of transport. Aeroplanes seem to offer but slight assistance for the main bridging, as the distance of flight with a traffic load without landing seems likely to be always limited. With air-ships, however, there would seem to be great possibilities for the carrying on of commerce between far-distant places and countries without the necessity of landing at every few hundred miles. It may well be that in the development of air-ships may lie the future of our great Empire. The most direct routes, which air-vessels can follow, will shorten many of the distances enormously. The higher speeds of air-vessels will be equivalent to reducing these shortened distances by 50 per cent or more. There are many difficulties to be overcome before this can be an accomplished fact. The enormous progress made in the last ten years makes for optimism that the difficulties will be overcome. If the statesmen of the Empire really believe in the urgency of great improvements in the means of communication between the several parts of the Empire, and have the courage of their convictions, the optimism will almost certainly prove well-founded. It is not suggested that air-vessels will take the place of shipping generally. It is rather that they may take the place of the fastest liners in the conveyance of passengers to whom time is of great value, of mails and of merchandise of high value. This transfer of traffic would permit of the working of the steamers at more economical speeds with a consequent lowering of charges.

Just as air-transport is removing the disabilities which are inseparable from being tied to the land or sea, so do we find wireless telegraphy and telephony improving other means of communication. They are at present no more supplanting the communication by wire than the air-vessel is supplanting the railway train and the steamer. Wireless communications can, however, do what the wired forms of communication cannot. Shipping has been made safer. Communications can be established by wireless, where the cost of telegraph wires would be prohibitive. Wireless messages are, however, still subject to interruption from the forces of nature. Cables are still the most reliable, and reliability is a factor of great moment. Like air-transport, however, it suggests ultimate prospects of better and cheaper communications between the various parts of the Empire.

CHAPTER II

THE SHIPPING OF THE BRITISH EMPIRE

MERCHANT shipping has always occupied in the economic system of the world a place out of all proportion to the capital which it represents or the number of persons employed in it. Modern life is built upon the interchange of the products of widely sundered nations. To none is shipping more vital than to the group of nations that constitute the British Empire. But the steamships by which the commerce of the world is conducted have never numbered 9000. The personnel of the ships do not number half-a-million, and those employed on construction and repair work will number little more than half as many. The total value of all the ocean-going ships in the world before the Great War was not more than some £300,000,000. The railways of the United Kingdom alone require as many men, and the London, Midland and Scottish Railway employs a larger amount of capital.

Whilst the British Empire has for generations been the greatest owner of shipping tonnage, and more especially of ocean-shipping tonnage, the effect of the War has been to reduce the proportion of tonnage flying the British flag, though the quantity of tonnage flying the flag is about one and a half million

PRINCIPAL SEA STEEL AND IRON STEAM TONNAGE, MIDSUMMER 1914 AND 1923

Country.	June, 1914.		June, 1923.	
	Tonnage owned in millions of tons.	Percentage of World's total.	Tonnage owned in millions of tons.	Percentage of World's total.
British Empire . .	20·3	47·7	21·7	36·2
United States[1] . .	1·8	4·3	13·4	22·1
France . . .	1·9	4·5	3·5	5·8
Germany . . .	5·1	12·0	2·5	4·2
Holland . . .	1·5	3·5	2·6	4·3
Italy . . .	1·4	3·4	2·9	4·8
Japan . . .	1·6	3·9	3·6	6·0
Scandinavia . .	3·7	8·7	3·5	5·9
Spain . . .	·9	2·1	1·2	2·0
Austria-Hungary .	1·1	2·5	0	0
Rest of World . .	3·2	7·4	5·2	8·7
World's Total .	42·5	100·0	60·1	100·0

[1] Steamers on the Great Lakes excluded.

tons more than in 1914. As will be seen from the table on the previous page, the British share in the world tonnage has decreased from 47·7 per cent to 36·2 per cent. The United States meanwhile has improved its position from 4·3 per cent to 22·1 per cent, whilst Germany has declined from 12·0 per cent to 4·2 per cent. The British Empire is the only one of the Allied Powers to find itself in an inferior position relatively to the rest of the world as the result of the War.

There has at the same time been a great change in the composition of the various fleets of the world. The average size of ships has been materially increased. The tonnage of ships owned within the British Empire between 1500 and 5000 tons has declined between 1914 and 1921 from 11,508,000 to 7,788,000 tons, whilst between 5000 and 10,000 tons there has been an advance from 5,338,000 to 8,802,000 tons, and of 10,000 tons and upwards from 1,983,000 to 2,701,000 tons. The changes in other countries have been similar, though the proportions have varied. The world's tonnage changes are as follows :—

	Tonnage, 000's omitted, 1914.	1921.
1,500 to 5,000 tons . .	23,485	22,280
5,000 to 10,000 ,, . .	10,496	22,910
10,000 tons and upwards .	3,432	4,590

Vessels of less than 1500 tons gross have been omitted as they are chiefly employed on local, coasting, and Continental trades.

Sir Westcott Abell, in Section 2 of the " Reconstruction in Europe " series of supplements published by the *Manchester Guardian* made an interesting comparison of the ages of the steam and motor vessels registered in the United Kingdom at the close of 1913 and 1919. The fleet, measured by numbers of vessels, was on the average two and a half years older, but if measured by tonnage only one year older. However, the vessels between 5000 and 10,000 tons, which represent nearly half the gross tonnage, are a good half-year younger than the pre-War fleet.

Another material change which has taken place in shipping has been the increased use of oil for the propulsion of ships. The Diesel engine is the best power-producer known for marine purposes. It produces twice as much power per ton of oil fuel as is produced by steam-turbines burning oil under their boilers, and four times as much power per ton of fuel as is given by the ordinary triple expansion engine with boilers burning coal under them. Running efficiency must therefore depend on the costs of oil fuel and coal. The oil fuel for Diesel engines is of a special quality, and roughly it may be said that if its cost per ton be four times as much as that of good steam coal, the cost per ton-mile for the Diesel engine vessel will be approximately equal to the cost per ton-mile for the ship with geared turbines and coal-fuel boilers, after making allowances for the saving in wages of the crew, and the freights on the extra cargo which the Diesel-engined ship can carry. The Diesel engines still cost more, but bunkering with oil is much less costly than filling coal bunkers. The abolition of firemen is a great advantage to the working of the ship.

There is no question that the internal-combustion engine as a means of marine propulsion has established itself on a firm basis. The rate of its growth will depend upon supplies of oil fuel being available at an economical price as compared with coal. The increased use of oil as a marine fuel is well illustrated by the following table, which gives the number and tonnage of vessels recorded in Lloyd's Register book of 1500 tons gross and upwards, fitted with oil engines. Moreover, at the 30th September, 1923, slightly over 24 per cent of the tonnage of vessels then under construction were to be fitted with internal-combustion engines.

Divisions of Tonnage.	Vessels Recorded in Lloyd's Register Book for :—			
	1914–15.		1921–22.	
	No.	Gross tons.	No.	Gross tons.
1,500 to 5,000 . .	34	116,952	160	412,040
5,000 to 10,000 . .	10	58,272	65	441,489
Total . .	44	175,224	225	853,529

The total number of vessels fitted for burning liquid fuel is very much greater than this. At 30th June, 1923, the vessels numbered 3013, of which 1690 were over 5000 tons, and amongst them are included four of the five largest liners in the world. Though there are many advantages for liners to be gained by the use of oil fuel, economy is not one of them. It does not matter whether turbines or reciprocating engines are used, it is most costly to burn oil under boilers.

The increasing use of oil as a generator of power not merely for ships, but even more for land and air-transport inevitably raises the question of the carriage of the oil itself. Pipe lines serve the purpose for the conveyance from the producing areas to the ships which have been specially built for the carriage of oil in bulk. Not only are the vessels all of a special character, but the bulk are comparatively new, as is shown by the fact that at the close of 1913 the total of oil fuel or petroleum tanker vessels recorded in Lloyd's Register was 333 of 1,245,000 tons gross, and at the 30th June, 1923, 1018 of 5,441,000 gross tons. The United States has far outstripped the British Empire in the development of this section of their merchant marine. In 1913 the U.S.A. had 54 vessels with a gross tonnage of 192,353 tons ; eight years later the vessels numbered 409, whilst the gross tonnage had increased to 2,526,689 tons, an increase of 1200 per cent. At the earlier date the British Empire had 163 vessels with a gross tonnage of 682,975 tons, whilst eight years later the figures were 319 and 1,530,360 tons, the tonnage increase being about 125 per cent. Not only had the British Empire lost the first place in both numbers of vessels and tonnage, but her vessels average 1000 gross tons apiece less than those of the United States.

The increase of tonnage for the conveyance of petroleum and fuel oils in bulk is not unreasonable in relation to the growth in the production of oil in the world. The oil produced was estimated at 52,000,000 tons in 1913; by 1920 it had risen to 95,000,000 tons; the following year to 105,000,000 tons; and in 1922 to 120,000,000. The output of the United States represented about 62 per cent, and as it is estimated that the United States exported only 25 per cent of this, it is possible to immediately mark down a large part of the world's oil output as making no demand on ocean shipping.

Of the 21,000,000 tons of sea-going ships owned within the British Empire, the great bulk is in the hands of private enterprise. Two of the Dominion Governments are, however, in possession of fleets—Canada and the Australian Commonwealth. The former owns 64 vessels of 248,000 gross tons, whilst the latter owns 22[1] vessels of 154,400 gross tons. The ownership of these vessels by the Governments has given rise to considerable feeling, as competition between these vessels and those worked by private enterprise is on an unequal basis owing to the immunity of the former from taxation. The question is not confined to shipping, but arises generally in connection with trade enterprises conducted by Governments. The matter came before the Imperial Conference (1923) with the result that a resolution was passed as follows:—

> Any Government within the Empire, so far as it engages in trade, shall be treated as liable to the taxation of any other country within the Empire in which it may either own property in connection with trade or make trade profits; the liability of the United Kingdom Government or any Dominion Government so far as engaged in trade shall be coextensive with the liability of a private trading corporation in similar circumstances. It is further agreed that each of the several Parliaments of Great Britain, the Dominions, and India shall be invited to enact at the earliest possible opportunity a declaration that the general and particular provisions of its Acts or Ordinances imposing taxation shall be deemed to apply to any commercial or industrial enterprise carried on by or on behalf of any other such Government in the same manner in all respects as if it were carried on by or on behalf of a subject of the British Crown. It is not contemplated that such legislation should have retrospective effect for any year prior to 1924.

The principle of this resolution would apply to shipping, but shipping may easily raise questions with foreign Governments. As regards these it is hoped that reciprocal agreements will be made with the Empire so that a Government trading in another country shall not, in its character as such, be treated as entitled to any sovereign immunity from taxation either directly or through the claim of superiority to the jurisdiction of municipal courts; nor shall it be treated as entitled to any sovereign immunity from taxation in respect of property in the other country concerned which it may own or hold in a trading capacity or in connexion with trade. Specifically on the question of the immunity of State-owned ships, the Conference recommended "that the draft convention on the immunity of State-owned ships adopted by the meeting of the Maritime Law Committee of the International Law

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[1] The Australian Commonwealth also owns 13 vessels of 43,600 gross tons employed on local service.

Association, held at Gothenburg in August last (1923), and amended after consultation between the British Admiralty and Board of Trade, should be adopted throughout the Empire as the basis on which an international convention might be concluded." The draft Convention reads as follows :—

IMMUNITY OF STATE-OWNED VESSELS

RESOLUTIONS PASSED 17TH AUGUST, 1923

Art. 1.—Vessels owned or operated by States, cargoes owned by them, and cargo and passengers carried on such vessels and the States owning or operating such vessels shall be subjected, in respect of claims relating to the operation of such vessels or to such cargoes, to the same rules of liability and to the same obligations as those applicable to private vessels, persons, or cargoes.

Art. 2.—Except in the case of the ships and cargoes mentioned in paragraph 3, such liabilities shall be enforceable by the tribunals having jurisdiction over and by the procedure applicable to, a privately owned ship or cargo or the owner thereof.

Art. 3.—In the case of :

(*a*) Ships of war and other vessels owned or operated by the State and employed only in Governmental non-commercial work ;

(*b*) State-owned cargo carried only for the purpose of Governmental non-commercial work on vessels owned or operated by the State, such liabilities shall be enforceable only by action before the competent tribunals of the State owning or operating the vessel in respect of which the claim arises.

Art. 4.—The provisions of this Convention will be applied in every contracting State in all cases where the claimant is a citizen of one of the contracting States, provided always that nothing in this Convention shall prevent any of the contracting States from settling by its own laws the rights allowed to its own citizens before its own Courts.

Closely connected with this question of immunity from taxation is the question of double taxation. This again is not merely an Empire or a shipping problem, but affects other kinds of business carried on in more than one part of the Empire, or in one part of the Empire and a foreign country. The League of Nations is considering the practicability of some international arrangement. Meanwhile, in the case of shipping, the United States have offered to exempt from taxation the profits of foreign ships trading to American ports on the condition of reciprocity, and by legislation the British Government has obtained power to reciprocate such exemption not only in the particular case but wherever it may be granted by a foreign State. Within the British Empire many mutual arrangements have been made aiming at some relief from the double payment of income-tax, but these arrangements give no privileges to shipping which are not equally enjoyed by other trades. The general equity of double taxation cannot be discussed here. It is sufficient to notice that in the case of shipping it increases losses at a time like the present, when very many voyages are being run without profit or even at a loss ; whilst in times of prosperity it increases the freights to be paid by shippers and the fares to passengers.

The ship-owners have recently laid their case before the Imperial Shipping Committee, and the Committee have issued a report on the practical grievances which arise from the methods of assessment. The ship-owners' case rests mainly on the impossibility of apportioning their profits as between the various countries to which they trade. Such division is essential for equity, but owing to the impracticability of making the division, arbitrary assessments are frequently substituted instead of an attempt being made to estimate a profit. Thus, in Australia, in the case of non-resident ship-owners, the Federal Act assumes an Australian profit of 7½ per cent (formerly 10 per cent) of the amount received for freight, passengers and mails shipped at Australian ports for carriage overseas, whilst as regards State taxation the assumed profit is 5 per cent. There is no option under the Federal Act or under the Acts of the individual States of claiming an assessment on the profits actually realised. In South Africa the non-resident ship-owner is given the option of an assessment either on an assumed profit of 10 per cent of the outward freights and passage money, or based on realised profits. In India an Act of 1923 provides in the case of tramps that, where charterers and owners have no recognised agent in India, assessment shall be made on 5 per cent of the freight and passage money. In other cases where profits are not definitely ascertainable an assessment may be made at such percentage of the turnover as may be considered reasonable. Though in all cases in India definitely ascertained profits, or profits estimated at an amount which bears the same proportion to the total profits of the business as the receipts accruing in India bear to the total receipts of the business may be substituted. In some of the Colonies and Protectorates taxation has been levied on an assumed profit of certain percentages of outward freights and passage money. There is, however, a marked tendency to adopt the system of taxing on realised profits. Elsewhere in the Empire the usual practice is to tax on realised profits, though in the case of the United Kingdom the non-resident ship-owner is not charged income-tax if he merely carries on business with the United Kingdom, and not in it. The non-resident shipping company, however, which maintains a regular service with the United Kingdom and has an agency in it, is taxed on the profits made in the United Kingdom. It is often difficult to produce convincing evidence as to the exact amount of these profits, so that the profits have sometimes to be computed. For such computations there are no established rules. Sometimes a percentage basis is applied; sometimes the profits assessable in the United Kingdom are taken as bearing the same ratio to the total profits of the undertaking as gross receipts earned in the United Kingdom to the gross receipts of the whole undertaking. Each individual case is in fact left to be determined upon its merits by the Income-tax Commissioners. In passing, it may be noticed that, when the tax is by a percentage of receipts, there is commonly the power to refuse clearance of a ship until the tax is paid, or satisfactory arrangements made for its payment.

The ship-owners' complaint, under the general head of the impossibility of ascertaining the precise amount of profit applicable to each country with which they trade, is divided, in the Imperial Shipping Committee's report, into the following three parts :—

(i) The arbitrary nature of a tax levied on a certain percentage of gross receipts.

(ii) The loss of time and labour, and the expense involved where the tax is leviable not on such a percentage, but on net profits, owing to the different methods of assessment within the various countries with which a ship-owner may trade.

(iii) The difficulties experienced in obtaining relief from the double payment of income-tax and the inadequacy of the relief when obtained.

Arbitrary assessment for income-tax assumes a fixed relation between profits and turnover which does not exist. The divergence is the greater when the assumption is made in regard to outwards traffic only, and without regard to the receipts from a round voyage. No ship-owner dreams of calculating his profits on less than the round voyage, whilst the liner owner finds it necessary to use the year as the unit, owing to the seasonal nature of much of the traffic on most routes and the necessity of averaging the slack season with the busy season. A percentage on outward freights and passage money will often at the present time result in taxes being levied when even the round voyage shows a loss.

In addition to this, when by way of income-tax a percentage charge is made upon the freights and fares on the outward traffic from a given port, such charge tends to be treated as a part of the port charges. These charges are always taken into account by the ship-owner when comparing the values of the various freights open to him. In this way the tax tends to put a port at a disadvantage as compared with other ports, and there is a consequent reaction on the producers who ship through that port, as they either lose in service or must pay more for it.

Turning to the second head, when the Scylla of assessment by percentage of profits is avoided, the ship-owner finds himself in the Charybdis of the multiple assessment of realised profits. The laws relating to income-tax in the various parts of the Empire differ, and the same shipping company may have to make quite different returns to each part. The varying dates at which the fiscal years end is an obvious example, as it may entail a company splitting its accounts to cover different fiscal years. The rules of the taxing authorities with regard to depreciation may vary, each authority allowing rates of depreciation which differ from those allowed by the others in some respects. The requirements for the United States amongst foreign countries have in the past caused the most trouble, fifteen to twenty schedules, many of them lengthy and complicated, having to be filled up by the ship-owner. The burden thrown on the shipping company, not only in making the returns, but in ordinarily arranging its accounts so as to make it at all practicable to prepare the returns to all the different requirements, is heavy and costly. One liner company estimated that the returns which they had to make in connection with the proportion of their profits taxable in the United States, were costing them £6000 to £7000 a year in direct expense. This is for one country only and is an addition to the time occupied by the heads of the company in dealing with income-tax questions instead of the constructive work of the business.

Finally come the difficulties in the operation of ships from double taxation

Some ship-owners in the United Kingdom after a long period of depression, such as we are now passing through, have, on the average of three years, made no profit, and are paying no income-tax to the British Government. These have nothing out of which to claim relief for tax already paid in the Dominions or other parts of the Empire. The Imperial Shipping Committee came to the unanimous conclusion " that complexities and anomalies do exist, and that with the more general introduction of the option of taxation on realised profits they may for a time, at any rate, tend to increase."

In conclusion the Imperial Shipping Committee declined to make any definite recommendation on the ground that " in so far as the necessity for raising revenue is concerned, the matter passes beyond our reference." At the same time the Committee considered that a prima facie ground of complaint had been established ; also that, whilst the difficulties may not appear very great in connection with any one jurisdiction, in the aggregate of the whole Empire they amount to an impediment to commerce. The matter should be considered first by the fiscal authorities of the several parts of the Empire, and then the suggestion is made that it should be referred to some appropriate body for further investigation.

NOTE.—Since this chapter was written, the question was discussed at the Imperial Economic Conference, and resolutions were passed which, if carried out, should remove many of the causes of complaint. The reader is referred to the Proceedings of the Imperial Economic Conference, p. 17 and pp. 346–350. Cmd. 2009.

CHAPTER III

THE HAGUE RULES, AND THE CARRIAGE OF GOODS BY SEA BILL, 1923[1]

In the last chapter some matters have been noticed in which lack of uniformity has and is causing trouble to ship-owners. The great variety in the terms of bills of lading has been a continuous source of discontent. Without considering whether the terms were in themselves reasonable or not, it is only human nature that discontent should be generated when the liability of the shipper was subject to frequent variation, and often very difficult of ascertainment. Efforts made from time to time have resulted in legislation in various countries. The United States came first with the Harter Act. This was followed by the Sea Carriage of Goods Act in Australia, the Water Carriage of Goods Act in Canada, and sections of the New Zealand Shipping Act. These Acts differ in important particulars, though similar in a general sense. In the matter of uniformity shipping has moved more slowly than railways. In Europe the need for international uniformity in many railway matters is great, and in the domain of freight traffic this has been attained to a very large extent by means of an international treaty signed at Berne in October, 1890. The treaty, amongst other matters, provided for uniform through bills of lading ; fixed liability in cases of delay and loss ; prohibited special contracts, rebates and reductions, except when publicly announced and available to all ; and prescribed certain Custom-house regulations. Any violation of the treaty can be punished in the courts, and, a judgment having been given in one country, the courts of the others are bound to assist in its execution, unless the decision definitely conflicts with their own laws. So far as a question of fact is concerned, there is no appeal. A subsequent effect has been for countries to alter their internal code to bring it into line with the provisions of the international code. So long as twenty years ago Germany, Austria, Hungary, Russia, Switzerland, and, to a less degree, France, had taken such action.

Shipping and railways differ so much that the one cannot be a rule to the other. Within the Empire, however, the need for a standard bill of lading, and for a common agreement on the definition of the ship-owner's liability for cargo is every bit as great as the corresponding railway need was on the Continent of Europe. The first decided Imperial move was made in February, 1921, when a Government committee, composed of representatives of the Dominions and India, and official, merchant, and shipping representatives of this country, recommended legislation throughout the Empire on the lines of the Canadian Water Carriage of Goods Act. Neither the Canadian nor any other Act had any chance of adoption without alteration. The matter was, however, being taken up about the same time as an international question, and at the meeting of the Maritime Law Committee of the International Law Association held in May, 1921, a special committee was appointed to draw up a code of regulations dealing with the question of a ship-owner's liability for cargo on the lines of the various Acts to which allusion has already been made above, and of the Imperial Committee's report. Whilst this code of regulations was in process of being drawn up, the International Chamber of Commerce met in London and passed a resolution in favour of a standard bill of lading that had been introduced by American cargo interests. This resolution was later cancelled, and the code of Maritime Law Committee adopted. At a meeting at the Hague in the following July the code was discussed by representatives of all interests, and by the close of the meeting the Hague Rules, 1921, had evolved with the unanimous agreement of every representative present to every line of them. The Rules have been since amended.

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[1] Some slight modifications and additions have been made in the Bill issued in 1924.

The Rules can be applied to a very large extent by a simple endorsement on a bill of lading with some words such as "subject to the Hague Rules, 1922," but in so far as the Rules may conflict with the law with respect to the carriage of goods by sea the endorsement would not be wholly effective. The Bill to amend the law in the United Kingdom has as its object to make completely effective the Hague Rules as embodied in a draft Convention unanimously approved at the International Conference on Maritime Law, held at Brussels in October, 1922.

The text of the Bill in its latest form[1] is printed as an Appendix to this chapter. The object of the Rules, and so of the Bill, is to limit the power of the ship-owners to divest themselves of all responsibility by binding them by effective measures to accept such reasonable responsibility as will ensure that they take every possible care of the cargo handed to them, and give a proper account of the same in the delivery of the goods. The Bill consists of six sections with the Rules as a Schedule, which Rules are divided into eight Articles.

Article I deals with definitions of the terms "Carrier," "Contract of Carriage," "Goods," "Ship," and "Carriage of Goods." The last is to cover the period from the time when the goods are loaded on to the time when they are discharged, that is to say, it is to cover the sea carriage only though the bill of lading may be a through bill, including inland transport by railway or inland waterway. Article II is entitled "Risks" and makes the Rules universally applicable.

Article III defines the responsibilities and liabilities of the ship-owner, and the first two clauses are the most important. They require that the carrier shall be bound to exercise due diligence in respect of seaworthiness in its various aspects; also that he shall properly and carefully handle and care for the goods throughout the period of the "Carriage of the Goods." Clause 3 provides for what has been a special demand of the merchants for many years, namely, that the merchant ought to receive a bill of lading which was incontestable as to the accuracy of the description of the goods received by the ship-owner. To obtain it the shipper must supply necessary particulars in such a way that checking is reasonably possible. This clause, it may be noticed, is only provisional in its application. This incontestable bill of lading need only be issued if the shipper demands it, and, if the shipper has supplied in writing, before loading starts, the leading marks, and either the number of packages or pieces, or the quantity, or weight of the goods. Clause 6 deals with prima facie evidence in regard to the condition of the goods at the time of delivery. If the consignee or his agent does not on his receipt or within three days state that the apparent order and condition of the goods is other than satisfactory, then this will be prima facie evidence that the delivery has been effected satisfactorily. Though this makes it more difficult for a claim to be set up later, it can be set up any time within twelve months, a length of time which seems generous to the merchant, and rather a hardship to the ship-owner. The next clause compels the issue by the carrier or his agent of a " shipped " bill of lading once the goods have been loaded on board, provided that, if the shipper has previously taken up any other document of title, such as a " received for shipment " bill of lading, he must first surrender it. The carrier may by due endorsement convert such document into a " shipped bill of lading."

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[1] A later form was issued dated 27th February, 1924.

The final clause (8) prohibits any reduction or minimising of the responsibilities and liabilities fixed on the ship-owner by the Article, otherwise than as provided in these Rules. This is one of the most important of all the clauses. It ensures that an acceptance of the Rules by the several parts of the British Empire will bring about a large measure of Imperial uniformity, whilst their acceptance by foreign nations will add to the Imperial international uniformity.

Article III having fixed absolutely the ship-owner's liabilities and responsibilities which he must always undertake, it has to be admitted that the ship-owner on his side has rights, and is entitled to immunities. Article IV sets out these. Clause 1 relieves the ship-owner from claims arising from unseaworthiness provided the ship-owner has on his part exercised the due diligence required by Article III, Clause 1. If that clause is adequate, as it appears to be, then this immunity is no more than simple justice. Clause 2 sets out the usual list of happenings outside the control of the carrier, which have been recognised as entitling him to immunity in previous legislation. The only addition is the final section, which provides for any cause which properly belongs to the class and may have been overlooked. Whether this will ever serve as any additional protection it is impossible to say, but, in the hundreds of years in which shipping has been used for trade, it is probable that the ground has been already covered. Clause 3 grants an immunity to the shipper from any liability for loss or damage sustained by the carrier or the ship when the shipper is in no way in fault either personally or by his representatives. This clause was not in the Hague Rules, 1921, and its addition may save merchants trouble and expense. Clause 4 deals with deviation and is designed to prevent reasonable deviations being made a ground for invalidating contracts. Considerable as this advantage will be to the carrier, it may prove of almost equal advantage to the shipper who was liable to find his contracts and insurance policies were liable to be invalidated by a small and perfectly reasonable deviation.

Clause 5 limits the liability of the carrier and the ship to £100 per package, unless a higher value has been inserted on the bill of lading. In a sense any limitation is a privilege granted to the ship-owner, but, in view of existing practice, this might well be considered rather as a concession on the part of the ship-owner to the merchant. There is no question that ship-owners view it from this standpoint, and there is said to be no clause in the Rules to which they assented with greater reluctance. Clause 6 quite rightly relieves the carrier and the ship from all liability when the shipper has deliberately stooped to deception in regard to the goods ; whilst the final clause makes necessary provisions in regard to the dealing with dangerous goods.

Article V may well be contrasted with the final clause of Article III. The latter prohibited the carrier or ship from contracting out of obligations, whereas the former places him at liberty to surrender as much as he choses of his rights and immunities by endorsement of the bill of lading. The clause also exempts charter-parties from the provisions of the Rules, but if bills of lading are issued in such a case they must comply with the Rules.

Had the Rules stopped here, they might well have been subjected to severe criticism on the ground of their extreme rigidity. In transport, cases occur from time to time of such a special character that both consignor and carrier wish to make a special contract for the particular carriage. If such special contract could not legally be made, then the carrier would refuse to carry. This might seriously interfere with the development of an entirely new trade. Article VI provides for such cases by permitting special contracts to be made for any particular goods. That the permission may not be abused, no bill of lading is permitted to be issued. The terms of the special contract may only be embodied in a receipt, which is to be a private document between the parties agreeing to it, and must be marked as "not negotiable." To make assurance doubly sure, a proviso has been added expressly forbidding special contracts in the case of ordinary commercial shipments, made in the ordinary course of trade. An exception is made in the Bill in respect of the coasting trade.

Article VII is simply the complement to the definition of the term "Carriage of Goods" in Article I. It provides that outside the period of the "Carriage," carrier and shipper are free to make agreements in any terms they like. At such a time the carrier is no longer acting as "Carrier by Sea," and obviously Rules relating to Carriage by Sea only cannot apply. Article VIII, which completes the Rules, provides that the Rules shall not alter the statutory limitation of liability of owners of sea-going vessels, nor the obligations which go with the limitation.

To return to the text of the Bill, Section I imposes the Rules on ships carrying goods from any port in Great Britain or Northern Ireland to any other port. Clause 2 provides that there shall be no absolute warranty of seaworthiness in contracts to which the Rules apply. Under Clause 3 bills of lading, which are subject to the Rules, must contain an express statement to this effect. Clause 4, as already mentioned, grants to the coasting trade the right to make special contracts under Article VI of the Rules regardless of the class of the goods. Clause 5 makes special provision in regard to bulk cargoes, which will usually mean that the weight entered on the bill of lading will not be prima facie evidence against the carrier of the receipt of the goods—a very reasonable and necessary protection for the carrier without which many bulk trades could only be carried on under great difficulties.

In spite of some severe criticisms of the Bill by one or two prominent authorities on Shipping Law, the general tenor of the Bill would bring so many advantages that its final enactment is to be hoped for, and also that it may soon be followed by similar legislation throughout the Empire.

A
BILL
INTITULED

A.D. 1923.

An Act to amend the law with respect to the carriage of goods by sea.

Whereas at the International Conference on Maritime Law held at Brussels in October, 1922, the delegates at the Conference, including the delegates representing His Majesty, agreed unanimously to recommend their respective Governments to adopt as the basis of a convention a draft convention for the unification of certain rules relating to bills of lading:

And whereas it is expedient that the rules contained in the said draft convention and set out in the Schedule to this Act (in this Act referred to as "the Rules") should be given the force of law:

Be it therefore enacted by the King's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:—

Application of Rules in Schedule.

1. Subject to the provisions of this Act, the Rules shall have effect in relation to and in connection with the carriage of goods by sea in ships carrying goods from any port in Great Britain or Northern Ireland to any other port whether in or outside Great Britain or Northern Ireland.

Absolute warranty of seaworthiness not to be implied in contracts to which Rules apply.

2. There shall not be implied in any contract for the carriage of goods by sea to which the Rules apply any absolute undertaking by the carrier of the goods to provide a seaworthy ship.

Provisions as to bills of lading.

3. Every bill of lading, or similar document of title, issued in Great Britain or Northern Ireland which contains or is evidence of any contract to which the Rules apply shall contain an express statement that it is to have effect subject to the provisions of the said Rules as applied by this Act.

Special provision as to coasting trade.

4. Article VI. of the Rules shall, in relation to the carriage of goods by sea in ships carrying goods from any port in Great Britain or Northern Ireland to any other port in Great Britain or Northern Ireland or to a port in the Irish Free State, have effect as though the said Article referred to goods of any class instead of to particular goods, and as though the proviso to the Article were omitted.

Provision as to bulk cargoes.

5. Where under the custom of any trade the weight of any bulk cargo inserted in the bill of lading is a weight ascertained or accepted by a third party

other than the carrier or the shipper, and the fact that the weight is so ascertained or accepted is stated in the bill of lading, the bill of lading shall not be deemed to be prima facie evidence against the carrier of the receipt of goods of the weight so inserted in the bill of lading, and the accuracy thereof at the time of shipment shall not be deemed to have been guaranteed by the shipper.

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Short title, saving, and operation.

6. (1) This Act may be cited as the Carriage of Goods by Sea Act, 1923.

(2) Nothing in this Act shall affect the operation of sections four hundred and forty-six to four hundred and fifty, both inclusive, five hundred and two, and five hundred and three of the Merchant Shipping Act, 1894, as amended by any subsequent enactment, or the operation of any other enactment for the time being in force limiting the liability of the owners of seagoing vessels.

57 & 58 Vict. c. 60.

(3) The Rules shall not by virtue of this Act apply to any contract for the carriage of goods by sea made before such day, not being earlier than the thirtieth day of September, nineteen hundred and twenty-three, as His Majesty may by Order in Council direct, nor to any bill of lading or similar document of title issued, whether before or after such day as aforesaid, in pursuance of any such contract as aforesaid.

SCHEDULE.

RULES RELATING TO BILLS OF LADING.

ARTICLE I.

DEFINITIONS.

In these Rules—

(*a*) "Carrier" includes the owner or the charterer who enters into a contract of carriage with a shipper:

(*b*) "Contract of carriage" applies only to contracts of carriage covered by a bill of lading or any similar document of title, in so far as such document relates to the carriage of goods by sea, including any bill of lading or any similar document as aforesaid issued under or pursuant to a charterparty from the moment at which such bill of lading or similar document of title regulates the relations between a carrier and a holder of the same:

(*c*) "Goods" includes goods, wares, merchandises, and articles of every kind whatsoever, except live animals and cargo which by the contract of carriage is stated as being carried on deck and is so carried:

(*d*) "Ship" means any vessel used for the carriage of goods by sea:

(*e*) "Carriage of goods" covers the period from the time when the goods are loaded on to the time when they are discharged from the ship:

ARTICLE II.

RISKS.

Subject to the provisions of Article VI., under every contract of carriage of goods by sea the carrier, in regard to the loading, handling, stowage, carriage, custody, care, and discharge of such goods, shall be subject to the responsibilities and liabilities, and entitled to the rights and immunities hereinafter set forth.

A.D. 1923.

ARTICLE III.

RESPONSIBILITIES AND LIABILITIES.

1. The carrier shall be bound before and at the beginning of the voyage, to exercise due diligence to—

(*a*) Make the ship seaworthy:

(*b*) Properly man, equip, and supply the ship:

(*c*) Make the holds, refrigerating and cool chambers, and all other parts of the ship in which goods are carried, fit and safe for their reception, carriage, and preservation.

2. Subject to the provisions of Article IV., the carrier shall properly and carefully load, handle, stow, carry, keep, care for, and discharge the goods carried.

3. After receiving the goods into his charge, the carrier, or the master or agent of the carrier, shall, on demand of the shipper, issue to the shipper a bill of lading showing among other things—

(*a*) The leading marks necessary for identification of the goods as the same are furnished in writing by the shipper before the loading of such goods starts, provided such marks are stamped or otherwise shown clearly upon the goods if uncovered, or on the cases or coverings in which such goods are contained, in such a manner as should ordinarily remain legible until the end of the voyage;

(*b*) Either the number of packages or pieces, or the quantity, or weight, as the case may be, as furnished in writing by the shipper;

(*c*) The apparent order and condition of the goods:

Provided that no carrier, master, or agent of the carrier, shall be bound to state or show in the bill of lading any marks, number, quantity, or weight which he has reasonable ground for suspecting not accurately to represent the goods actually received, or which he has had no reasonable means of checking.

4. Such a bill of lading shall be prima facie evidence of the receipt by the carrier of the goods as therein described in accordance with paragraph 3 (*a*), (*b*), and (*c*).

5. The shipper shall be deemed to have guaranteed to the carrier the accuracy at the time of shipment of the marks, number, quantity, and weight, as furnished by him, and the shipper shall indemnify the carrier against all loss, damages, and expenses arising or resulting from inaccuracies in such particulars. The right of the carrier to such indemnity shall in no way limit his responsibility and liability under the contract of carriage to any person other than the shipper.

6. Unless notice of loss or damage and the general nature of such loss or damage be given in writing to the carrier or his agent at the port of discharge before or at the time of the removal of the goods into the custody of the person entitled to delivery thereof under the contract of carriage, or if loss or damage be not apparent within three days, such removal shall be prima facie evidence of the delivery by the carrier of the goods as described in the bill of lading.

The notice in writing will not be effective if the state of the goods has at the time of their receipt been agreed to be otherwise than as stated in the notice.

In any event the carrier and the ship shall be discharged from all liability in respect of loss or damage unless suit is brought within one year after delivery of the goods or the date when the goods should have been delivered. A.D. 1923.

In the case of any actual or apprehended loss or damage the carrier and the receiver shall give all reasonable facilities to each other for inspecting and tallying the goods.

7. After the goods are loaded the bill of lading to be issued by the carrier, master, or agent of the carrier, to the shipper shall, if the shipper so demands, be a " shipped " bill of lading, provided that if the shipper shall have previously taken up any document of title to such goods, he shall surrender the same as against the issue of the " shipped " bill of lading, but at the option of the carrier such document of title may be noted at the port of shipment by the carrier, master, or agent with the name or names of the ship or ships upon which the goods have been shipped and the date or dates of shipment, and when so noted the same shall for the purpose of this Article be deemed to constitute a " shipped " bill of lading.

8. Any clause, covenant, or agreement in a contract of carriage relieving the carrier or the ship from liability for loss or damage, to or in connection with goods arising from negligence, fault, or failure in the duties and obligations provided in this Article or lessening such liability otherwise than as provided in these Rules, shall be null and void and of no effect.

A benefit of insurance or similar clause shall be deemed to be a clause relieving the carrier from liability.

ARTICLE IV.

RIGHTS AND IMMUNITIES.

1. Neither the carrier nor the ship shall be liable for loss or damage arising or resulting from unseaworthiness unless caused by want of due diligence on the part of the carrier to make the ship seaworthy, and to secure that the ship is properly manned, equipped, and supplied, and to make the holds, refrigerating and cool chambers and all other parts of the ship in which goods are carried fit and safe for their reception, carriage, and preservation in accordance with the provisions of paragraph 1 of Article III.

Whenever loss or damage has resulted from unseaworthiness, the burden of proving the exercise of due diligence shall be on the carrier or other person claiming exemption under this section.

2. Neither the carrier nor the ship shall be responsible for loss or damage arising or resulting from—

(*a*) Act, neglect, or default of the master, mariner, pilot, or the servants of the carrier in the navigation or in the management of the ship :
(*b*) Fire, unless caused by the actual fault or privity of the carrier :
(*c*) Perils, dangers, and accidents of the sea or other navigable waters :
(*d*) Act of God :
(*e*) Act of war :
(*f*) Act of public enemies :
(*g*) Arrest or restraint of princes, rulers, or people, or seizure under legal process :
(*h*) Quarantine restrictions :

A.D. 1923.

(*i*) Act or omission of the shipper or owner of the goods, his agent, or representative :

(*j*) Strikes or lock-outs or stoppage or restraint of labour from whatever cause, whether partial or general :

(*k*) Riots and civil commotions :

(*l*) Saving or attempting to save life or property at sea :

(*m*) Wastage in bulk or weight or any other loss or damage arising from inherent defect, quality, or vice of the goods :

(*n*) Insufficiency of packing :

(*o*) Insufficiency or inadequacy of marks :

(*p*) Latent defects not discoverable by due diligence :

(*q*) Any other cause arising without the actual fault or privity of the carrier, or without the fault or neglect of the agents or servants of the carrier, but the burden of proof shall be on the person claiming the benefit of this exception to show that neither the actual fault or privity of the carrier nor the fault or neglect of the agents or servants of the carrier contributed to the loss or damage.

3. The shipper shall not be responsible for loss or damage sustained by the carrier or the ship arising or resulting from any cause without the act, fault, or neglect of the shipper, his agents, or his servants.

4. Any deviation in saving or attempting to save life or property at sea, or any reasonable deviation shall not be deemed to be an infringement or breach of these Rules or of the contract of carriage, and the carrier shall not be liable for any loss or damage resulting therefrom.

5. Neither the carrier nor the ship shall in any event be or become liable for any loss or damage to or in connection with goods in an amount exceeding 100*l*. per package or unit, or the equivalent of that sum in other currency, unless the nature and value of such goods have been declared by the shipper before shipment and inserted in the bill of lading.

This declaration if embodied in the bill of lading shall be prima facie evidence, but shall not be binding or conclusive on the carrier.

By agreement between the carrier, master, or agent of the carrier and the shipper another maximum amount than that mentioned in this paragraph may be fixed, provided that such maximum shall not be less than the figure above named.

The rate of exchange shall be taken to be the rate ruling on the day of the arrival of the ship at the port of discharge of the goods concerned.

6. Neither the carrier nor the ship shall be responsible in any event for loss or damage to or in connection with goods if the nature or value thereof has been knowingly misstated by the shipper in the bill of lading.

7. Goods of an inflammable, explosive, or dangerous nature to the shipment whereof the carrier, master, or agent of the carrier, has not consented, with knowledge of their nature and character, may at any time before discharge be landed at any place or destroyed or rendered innocuous by the carrier without compensation to the shipper, and the shipper of such goods shall be liable for all damages and expenses directly or indirectly arising out of or resulting from such shipment. If any such goods shipped with such knowledge and consent shall become a danger to the ship or cargo, they may in like manner be landed at any place or destroyed or rendered innocuous by the carrier without liability on the part of the carrier except to general average, if any.

A.D. 1923.

ARTICLE V.

SURRENDER OF RIGHTS AND IMMUNITIES.

A carrier shall be at liberty to surrender in whole or in part all or any of his rights and immunities under the Rules contained in any of these Articles, provided such surrender or increase shall be embodied in the bill of lading issued to the shipper.

The provisions of these Rules shall not be applicable to charterparties, but if bills of lading are issued in the case of a ship under a charterparty they shall comply with the terms of these Rules. Nothing in these Rules shall be held to prevent the insertion in a bill of lading of any lawful provision regarding general average.

ARTICLE VI.

SPECIAL CONDITIONS.

Notwithstanding the provisions of the preceding Articles, a carrier, master, or agent of the carrier, and a shipper shall in regard to any particular goods be at liberty to enter into any agreement in any terms as to the responsibility and liability of the carrier for such goods, and as to the rights and immunities of the carrier in respect of such goods, or his obligation as to seaworthiness, so far as this stipulation is not contrary to public policy, or the care or diligence of his servants or agents in regard to the loading, handling, stowage, carriage, custody, care, and discharge of the goods carried by sea, provided that in this case no bill of lading has been or shall be issued and that the terms agreed shall be embodied in a receipt which shall be a non-negotiable document and shall be marked as such.

Any agreement so entered into shall have full legal effect:

Provide that this Article shall not apply to ordinary commercial shipments made in the ordinary course of trade, but only to other shipments where the character or condition of the property to be carried or the circumstances, terms, and conditions under which the carriage is to be performed, are such as reasonably to justify a special agreement.

ARTICLE VII.

LIMITATIONS OF THE APPLICATION OF THE RULES.

Nothing herein contained shall prevent a carrier or a shipper from entering into any agreement, stipulation, condition, reservation, or exemption as to the responsibility and liability of the carrier or the ship for the loss or damage to or in connection with the custody and care and handling of goods prior to the loading on and subsequent to the discharge from the ship on which the goods are carried by sea.

ARTICLE VIII.

LIMITATION OF LIABILITY.

The provisions of these Rules shall not affect the rights and obligations of the carrier under any statute for the time being in force relating to the limitation of the liability of owners of sea-going vessels.

CHAPTER IV

SHIPPING FREIGHTS—CONFERENCES AND AGREEMENTS

IMPORTANT to ship-owners, merchants, and other shippers as the conditions contained in a bill of lading are, the actual freight rates to be paid are often the vital factor in determining the directions of trade. Moreover, the allocation of the world's tonnage to the world's needs is usually effected by the intricate but almost automatic processes of the freight market. So the amount of trade following a given route, and the adjustment of the shipping on the route, both turn on the freight rates charged on the route.

It is roughly accurate to say that, at the least, the minimum and constant requirements of transport between two countries are met by the regular liner services, and that, when new or seasonal demands arise for more transport, the liners are supplemented by the ubiquitous tramp. It is in the tramp rates that the variations in demand are most quickly reflected, and it is by the rise and fall of these rates that discrimination between the cargoes to be carried and those to be left behind is mainly effected. Equally, in times of depression, it is the rise and fall of these rates which determine the amount of shipping to be laid up and the amount to continue in operation. The same process operates more slowly and also less exactly with the liners. The liners may maintain a schedule of rates for a long period, and when movements occur the extremes are less far apart than is the case with tramps. In the long run, however, the general course of the freight market, operating in the first instance through the chartering of tramps, is reflected also in liner rates.

The present depressed state of the freight market—though it is no longer at the very bottom—is traceable to a number of causes. Prominent amongst them must be put the enormous destruction of shipping during the War, which led to abnormal efforts being made to increase the world's capacity for the production of ships. As the result, the shipbuilding capacity of the world has been estimated to be 115 per cent greater in 1919 than it was in 1913, though the increase in the world's mercantile marine was only about 10 per cent. This means that the shipbuilding capacity of the world was about 14 per cent of the tonnage in existence. This means a capacity, in addition to replacements, to about double the world's tonnage (already excessive) in about twelve years. There is not the least need of such a production of ships, and the sooner a substantial part of this power of production is converted to produce other commodities the better will it be for the industry and the world.

Then, in the next place, as part of her contribution to the Allies' efforts to win the War, the United States started on a huge shipbuilding programme in 1917. As the result by 1920, she had added between nine and ten million tons to her sea-going mercantile marine, most of which was owned and worked by the Government. After the War this fleet was turned to purely commercial uses. This vast mass of tonnage, built as it was without regard to cost, and operated with only a limited regard to economic considerations, exercised a powerful influence on the freight market, and was an important factor in the collapse which occurred in 1920. Actually by June, 1921, a monthly working deficit in the neighbourhood of £4,000,000 was being shown, whilst the annual cost to the taxpayer has been variously estimated between £100,000,000 and £150,000,000.[1] France, Canada, and Australia had also acquired fleets, which have had recourse to the taxpayers' pockets. A great deal of this tonnage has been since disposed of or laid up. In the case of the United States no less than two-thirds was said to be laid up early in 1922. The amount broken up is, however, quite moderate, so the laid up tonnage remains potential tonnage capable of re-entering the market on a moderate rise in freight rates and so has a continuously depressing effect.

Another change has been brought about by the increasing size of ships. Ships under 1500 tons gross are not looked upon as overseas vessels, being almost wholly employed in the coastal or Continental trade. Then the tramp is for the most part a steamer not exceeding 5000 tons, it being very difficult to handle a larger class of steamer for ordinary cargo purposes. Now the tonnage of vessels in these two groups has declined absolutely, whilst the tonnage of larger vessels, which may be said roughly to represent the liner class, has practically doubled. The great bulk of the Government-owned fleets have gone into liner service. A Government Department is obviously better fitted to handle regular liner services than the unforseeable irregular movements of the tramp. So the United States Board of Shipping set itself to organise new liner services, not only from American ports, but also in Far Eastern, Mediterranean, and other foreign waters. The Canadian Government has especially endeavoured to connect Canada with other parts of the British Empire by direct services, and otherwise has sought to develop new lines of trade. In contrast, Australia has pursued a policy of competition with existing liner services. In addition to these Government-owned fleets going mainly into liner services, there was, as the result of the War, a consolidation of many tramp services into liner groups. This is a process which is always going on in ordinary times, but which was much accelerated for a time owing to the War.

This development of the liner relatively to the tramp has emphasised an old and long-standing difference between the ship-owners and their customers. Tramps are owned by some hundreds of companies and individuals, ranging from considerable and old-established firms with a substantial fleet to individual owners of single ships, or even individual ownership of a single ship, the ownership being divided between several persons. Concerted action on the part of such a large and miscellaneous body in the matters of services or freight rates is almost impossible of attainment.

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[1] By a recent decision, the control of the Government-owned fleet is to pass from the Shipping Board to the Emergency Fleet Corporation. In this way it is hoped to secure the advantages of business control whilst still maintaining Government ownership. This is the plan originally adopted by the Canadian Government, which from the outset placed the control of their fleet in the hands of "Canadian Government Merchant Marine, Limited."

In the case of liners the matter is very different. The great bulk of these are in the hands of a small number of powerful companies, including therein the States to whom reference has been made: the number does not exceed forty. These companies have for the most part been long established, and possess highly developed organisations. Amongst these organisations are effective associations for the protection of their interests, included therein being international Conferences, designed more particularly to restrict competition in services and freight rates.

The advantages of regular sailings, and of voyages performed in a defined period of time to the trader are so well understood that it is needless to do more than refer to them. To supply these the ship-owner must despatch his vessel from the loading port at a specified date regardless of the amount of cargo and the number of passengers on board, and if the load is short, he must pay no heed to the existence of cargo which would complete the load and could be secured if the vessel delayed its sailing for twenty-four hours. When ships must make their voyage at a fixed date regardless of the load, it becomes necessary for the liner owners to take some steps to ensure that a certain minimum amount of traffic will be forthcoming at remunerative rates. This is practically impossible under free competition, and so the Shipping Conference came into being. The first conference, the Calcutta Conference, was formed nearly fifty years ago, in 1875. Equal rates were fixed from each of the ports from which steamers were despatched, and it was agreed that no preferential rates or concessions were to be given to any particular shipper or shippers. Whilst limiting the competition between the liner owners, this left the merchant free to use the liners when they were the most convenient, and also to take advantage of any chance opportunity of forwarding traffic by a tramp if thereby lower rates could be obtained. Under such conditions it was difficult, in fact almost impossible, for the liner companies to make reasonable profits and at the same time to give the regular fast service of the frequency required.

It was to meet these conditions that the Deferred Rebate system was introduced in 1877, and applied to the shipments of Manchester piece goods, which were then the mainstay of the trade. Rebates for loyalty there had been before, but these rebates had always been paid at the end of the period of loyalty. The new system provided that the payments were to be computed for a period of loyalty, but not actually paid unless the shipper had maintained the loyalty for a further period. The system of deferred rebates soon spread, until by degrees it covered the bulk of the main trade routes outward from Great Britain. It was introduced into the China trade in 1879, in the Australian trade in 1884, in the South African trade in 1886, in the West Africa trade and the North Brazilian trade in 1890, in the River Plate and South Brazil trades in 1896, and in the trade to the West Coast of South America in 1904. The trades to Canada and the West Indies were the only important outward trades to a part of the Empire which were entirely excluded. The system applies to all outwards cargo except coal and special shipments. Of berth cargo there is little in the outward trade from this country.

Not only has each conference its own area, but, where several trade routes intersect or adjoin one another, it is not unusual to find the conferences concerned have agreements or understandings with each other not to trespass on one another's domains. These understandings not to encroach depend for their enforcement almost entirely on the fear of retaliation, but, whatever be the compelling force, they are in general very loyally observed. The shippers, in the event of the members of a Conference exacting terms which are somewhat on the hard side, cannot count on being able to effect a breach in the Conference.

In the homeward trade the system has been applied to a much more limited extent. This is largely due to the character of the traffic. A large proportion of the homeward trade consists of staple articles—grain, rice, oils, timber, raw materials. These move in large quantities and are capable of being shipped in bulk or in whole cargoes at one port to be discharged at one port. For such goods low freight rates are of more moment than the high-class service of the liner. The liner does compete for such cargo when higher rated traffic is not forthcoming, but it is only in exceptional cases that the liner can command higher rates than those the tramp is offering. In some cases, when such cargo is an alternative to ballast, the liner will underbid the tramp. The balance of trade also affects the matter. If the homeward trade requires much more shipping than the outward trade, then the service supplied by the liner companies is incapable of carrying all the homeward cargo. Under such conditions it was impossible for the Conference lines to require the same degree of loyalty from shippers in their shipments which was expected and exacted in the outward trade. Within the Empire the South African homeward trade was a case in which the Deferred Rebate system could easily be imposed, as the traffic is very small in bulk compared with the outward traffic. This is a condition which has changed in recent years as the outcome of the development of the trade in agricultural products. As regards the Indian trade as a whole the tonnage for outward goods is not sufficient to deal with the homeward traffic. The result is that for traffic from Bombay and Karachi there is no rebate system, whilst in other homeward trades, where the rebate system does exist, it is of limited application.

Originally almost entirely confined to British line companies, the Conference system expanded to embrace Continental lines, and to cover Continental trade as soon as the development of Continental shipping reached a stage which rendered such action necessary. In some cases it is due to foreign competition rather than the competition of British lines that the Conferences have come into being. The agreements that the parties have made with one another have taken several forms, but whatever forms the agreement has taken it has generally provided for :—

(*a*) A division of areas.

(*b*) A consolidation of rebate systems—the same rebates applying to trades from the United Kingdom and from Continental ports.

(*c*) An agreement or understanding that the rates for similar goods from the United Kingdom and Continental ports should be identical.

The Royal Commission which reported on Shipping Rings in 1909, came to the following important conclusions in regard to Conferences employing the Deferred Rebate system :—

> (i) That a Shipping Conference making use of the Deferred Rebate system does possess, so far as the shipper of general merchandise is concerned, a limited monopoly.
>
> (ii) That the monopoly is dependent upon the system of deferred rebates or some " tie " equally effective, and upon the fact that the absorption by the establishment of a Conference of all or practically all the existing means of regular transportation renders it difficult for a single Line to compete successfully or, at any rate, to maintain its competition for a considerable time.
>
> (iii) That the limits to the monopoly lie not so much in the actual existence of other adequate methods of transportation as in the latent possibility of alternative methods coming into existence, if the monopoly be seriously and continuously abused.
>
> (iv) That the limitations upon a monopoly in any particular trade vary according to the circumstances of that trade.

A system which produced a partial monopoly was in the nature of things certain to result in complaints of an arbitrary and unreasonable use of the power that was in consequence in the hands of the liner companies. Perhaps the most serious charge levelled against it was that, whilst the system had had the effect of maintaining rates on an equality from the United Kingdom and Continental ports,[1] it failed in certain trades to have the same effect with regard to the United States, where the system was not in operation. This was recognised by the Royal Commission as " a grave defect " in the system which has in the past led to diversion of orders from this country to the United States of America, and thereby discounted the benefits obtained from the system.

The effect of the discontent is seen in legislation enacted in two British Overseas Dominions, and in the United States. In Australia, the " Australian Industries Preservation Act, 1906–10," made rebates definitely illegal for all traffics outward from that country. In 1911 the Union of South Africa Government passed a measure entitled, " The Post Office Administration and Shipping Combinations Discouragement Act." This attacked the system of deferred rebates by way of the mail contract. It provides that the Governor-General shall not enter into any ocean mail contract with any person who gives any rebate upon condition of the exclusive shipment of goods by vessels of particular lines. Finally, the United States of America made the system definitely illegal by the Merchant Shipping Act of 1916, as amended by the Act of 1920. This law is understood to apply to shipments in both directions.

The effects of all this legislation have been material. The Union Castle Mail Steamship Company, Limited, which held the mail contract between the United Kingdom and South Africa, was compelled to discontinue the Deferred Rebate system, and it was also dropped by other Lines in the South African Conference. It has been replaced by the Agreement system, which will be dealt with later. In the Australian trade a new factor has been the

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[1] This equality has been disturbed by the War and its after effects, but there is now a movement to re-establish it.

Commonwealth Line of steamers, which since the conclusion of the War has started to run regular services. The legislation referred to above made it impossible for this Line to become a party to the Conference, which had continued in operation in the outward trade to Australia. Shipment by the Government Line meant the loss of rebates, though the Government Line was ready to make these good to the shippers on certain conditions. This state of affairs led to complaint by the Australian Government and to the commencement of a freight rate war. The Imperial Shipping Committee, through its Chairman, was not only successful in arranging a conference between the parties to the dispute, but also in effecting a settlement whereby shippers were to have the option of adopting the Agreement system if they preferred it to the Deferred Rebate system, though they were not precluded from continuing the latter.

The relative merits of the Deferred Rebate and the Agreement systems from the points of view of the carrier and the shipper are worthy of some consideration. Both have as their objective the securing of regular, frequent, and efficient services at moderate, equal, and stable freight rates. The Conference system may almost be taken for granted as a necessity. Liner services require large capital resources, and a thoroughly organised central administration. Competition between liners in the same trade would be incompatible with stability of rates, and the merchant requires stability of rates as much as he requires reliability in the service. Equally the need for some " tie," which holds the shipper to the regular lines, is not only a ship-owner's claim, but is admitted by the majority of shippers. The Imperial Shipping Committee in its final report on the Deferred Rebate system (1923) stated that " most of the shippers who gave evidence before us were of opinion that some tie was necessary," and they then went on to add, " it appears to us that there is a clear mutual obligation—the shipper wants the ship on the berth without fail and the ship-owner wants the goods on the berth without fail. Hence we find that it is necessary for the Conferences to have some assurance of continuous support from shippers such as will constitute an effective method of preventing intermittent and irresponsible competition for berth cargo by outside ships."

When the Royal Commission on Shipping Rings reported, the only alternative tie to the Deferred Rebate system appeared to be a system of preferential contracts, a system which had operated before the Deferred Rebate system was introduced. The system of preferential contracts commended itself to neither the Commission nor the majority of shippers who gave evidence before the Imperial Committee, and a return to it was not desired. The Agreement system, first introduced into the South African trade, and recently agreed in the Australian trade is, however, an alternative which the Royal Commission had not in mind, and which has received a substantial backing from the Imperial Committee. The agreements in the two trades differ in some respects, so both are printed at the end of this chapter. The shippers who support an agreement undertake to give their entire support to the regular lines in the Conference concerned. In return, the lines undertake to maintain regular berth sailings at advertised dates, whether the ships are full or empty; to provide sufficient tonnage for the ordinary requirements of the trade; and to maintain stability of rates. In the South African agreement the rates are definitely prescribed, but in the Australian they are defined as "the net rates ruling from time to time without primage or rebate but subject to 5 per cent cash discount." Provision is made for revising the basic rates from time to time, but in each case the Conferences undertake not to make such alterations without first taking into consultation the South African Trade Association or the Australasian Merchants' Association, respectively. A difference between the two agreements, which should be noted, is that whereas the South African agreement was made with the South African Trade Association, the Australian agreement is made with firms individually.

The Agreement, like the Deferred Rebate system, has a twofold function. In the first place, it ensures to the Conference the entire support of shippers over the period of the contract. In the second, it ensures to the shippers that the carriers shall carry out certain obligations. In this it is superior to the Rebate system, for under that the advantages to the shippers are only implied, though they have on the whole been well observed. A further gain to the shippers is that they pay net freights, and there is no accumulation of funds, which must be looked on as part of the shippers' capital, in the hands of the ship-owners.

Though it is admitted that the South African agreement has worked well on the whole, the ship-owners were afraid of extending it to other trade routes, as it contained no penalties for breaches of the agreement, such as that provided by the deferred rebate. The shippers, on the other hand, have always felt it an injustice that under the Deferred Rebate system penalties were imposed on them without any corresponding penalties for the ship-owners for infractions of their implied obligations. This the Australian agreement remedies. The penalties to be paid by the shippers are identical with those incurred under the Deferred Rebate system—a very necessary condition when the shipper has a running option as to which system he should adopt. But Clause 7 of the Agreement, which sets out this, also provides that the ship-owners and brokers should equally be liable for loss incurred by the shippers in the event of breaches of the Agreement on their side, a limit being set to such loss identical with the amount which the shippers would have paid in the event of the breach being on their side. To avoid the possibilities of costly law suits over breaches of the Agreement provision is made for arbitration, the arbitrators and the umpire (if any) to be commercial men.

To make the Conference system, whether with deferred rebates or with agreements, work really at its best, some organisation of merchants and shippers of a weight sufficient to balance the powerful shipping companies organised in the conference is necessary. This was ground common to both the Majority and Minority Reports of the Royal Commission, as they came to the conclusion that without counter combinations of merchants and shippers the Conference and the Deferred Rebate system on occasion confer power on the shipping companies in excess of what is necessary to enable them to maintain an organised service. The Imperial Shipping Committee have placed it on record that their experience in dealing with questions arising between shippers and shipowners amply confirms this view, which they therefore strongly endorsed. If merchants and shippers are to have a reasonable control over the actions of the Conferences and if they are to have the advantage of the Agreement system as a regular alternative to the Deferred Rebate system, then it is of the first importance that they should organise without delay, and this is a matter which might usefully occupy the attention of such national bodies as the Federation of British Industries. The existence of Agreements like the two described would be practically impossible without powerful representative trade associations with which the Conferences can deal.

SOUTH AFRICAN TRADE AGREEMENT

Memorandum of Agreement between the undersigned South African Shippers and the undersigned regular Steamship lines trading to the Union Ports of South Africa.

1. This Agreement is entered into for the purpose of maintaining regular Steamship services from the United Kingdom and the Continent (Bordeaux to Hamburg both inclusive) to the South African Union Ports, with stability of freight and equality of rates to large and small Shippers alike, and in fixing the rates regard shall be had to the rates in other Overseas Regular Trades.

2. The undersigned Ship-owners hereby agree to supply Steamers to maintain the present regular berth sailings to the Union Ports of South Africa, and to provide sufficient tonnage for the ordinary requirements (including a natural increase) of the trade. Steamers to sail on the advertised dates as far as practicable, full or not full.

3. The rates of freight upon the revival of the Agreement shall be the following basis berth rates which have been agreed with the South African Trade Association :—

	Cape Town and Algoa Bay.	Mossel Bay, East London and Natal.
Goods rated in present Tariff at 90/– (Cape Town basis) . . .	80/–	85/–[1]
Goods rated in present Tariff at 70/– (Cape Town basis) . . .	60/–	65/–[1]

Mail Steamer rates (exclusive of primage) shall not be more than 5/– per ton in advance of rates by other steamers.

The above rates come into force after the 31st March, 1919 (with 5 per cent primage in respect of Mail Steamers only), but without rebates for all descriptions of cargo. The Ship-owners reserve liberty to revise rates as circumstances may require, but they shall not without consultation with the South African Trade Association make any general alteration in rates. In the event of no mutual agreement for an alteration in rates being reached the matter shall then be submitted to arbitration.

4. In consideration of the Ship-owners supplying and maintaining the regular services, the undermentioned Shippers agree to give their entire support to the undermentioned Steamship Lines from the United Kingdom and Continent (as defined in Clause 1).

5. In the event of anything occurring to disturb the stability and equality of rates the undersigned Ship-owners will forthwith take effective measures, in consultation and agreement with the South African Trade Association, to protect the interests of the Signatory Shippers, and should no agreement be arrived at within fourteen days, then any of the signatories hereto may withdraw from this Agreement upon giving thirty days' notice, but such notice shall be void if during the currency of same an agreement is arrived at. It shall,

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[1] These rates have since been modified by agreement with the South African Trade Association.

nevertheless, be competent for the parties by mutual consent to extend the time, for a period not exceeding thirty days, for the purpose of arriving at an agreement, and any notice of withdrawal given shall be void if during such extension an agreement is arrived at; but such withdrawal shall not invalidate this Agreement between the remaining signatories.

6. This Agreement shall not apply to large parcels of cargo not being Merchants' berth cargo, but the Ship-owners agree not to make special arrangements at preferential rates to the prejudice of those Shippers signing this Agreement, as regards the carrying off of such cargo, except with the concurrence of the South African Trade Association. This shall not apply to railway material. In the event of any disagreement between the Ship-owners and the South African Trade Association as to what is not Merchants' berth cargo, the same to be submitted to arbitration.

7. The Ship-owners shall be at liberty to suspend their obligations under this contract in the event of any declaration of war, or of war breaking out between any two or more first-class powers, or in the event of any revolution, riot, civil commotion, strike, lock-out, or labour dispute, rendering it impracticable for them to carry out the said obligations.

8. The Ship-owners undertake not to carry cargo on ship's account, except coals to fill up.

9. Notwithstanding anything in this Agreement any Shipper shall be at liberty to ship by sailing vessels.

10. All alterations in and additions to the tariff of rates of freight to be communicated to the South African Trade Association as hitherto.

11. Shippers signing this Agreement are to give the Ship-owners a list of marks on whose behalf they are willing to come under this Agreement, and if there be any Corporations, Companies, Firms, or Individuals for whom the said Shippers act who refuse to come into this Agreement, the said signing Shippers shall not be prejudiced thereby so far as their declared assenting marks are concerned, and the same shall apply to any withdrawal allowed by the terms of this Agreement.

12. This Agreement is to continue to 31st December, 19 , and is subject to six months' notice thereafter by any of the parties hereto for themselves only; provided, however, that in the event of this Agreement not securing stability and equality of rates (apart from Clause 5) the Ship-owners and the South African Trade Association shall meet to discuss the situation, with a view to such modification being made as may be considered necessary, and in the event of no satisfactory agreement being arrived at, any of the signatories hereto, for themselves only, may withdraw therefrom on giving three months' notice; and provided further that this Agreement may be terminated by any of the parties for themselves only, on giving fair and reasonable notice in the event of its being held to be a contravention of the Post Office Act, 1911. The Union-Castle Mail Steamship Company, Limited, may withdraw from this Agreement on giving fair and reasonable notice, but their withdrawal shall not otherwise terminate this Agreement, and Shippers shall have the liberty to ship by the Union-Castle Mail Steamship Company, Limited, from the Continent, Middlesboro, London, and Southampton.

Merchant's Signature..........................

STEAMSHIP LINES:—

The Union-Castle Mail Steamship Co., Ltd.
The Clan Line Steamers, Limited (Cayzer, Irvine & Co., Ltd.).
The Ellerman & Bucknall Steamship Co., Ltd.
Bullard, King & Co. (Natal Direct Line).
The Harrison-Rennie Line.
The Ellerman Line } Joint Service.
The Harrison Line }
The Houston Line (R. P. Houston & Co.).

Date........................19....

AUSTRALIAN TRADE AGREEMENT

Memorandum of Agreement between Messrs........................ on behalf of themselves and the various Companies and Firms as set out in the Schedule annexed hereto (hereinafter referred to as the Ship-owners and Brokers) loading vessels from the United Kingdom to Ports in the Commonwealth of Australia, and Messrs.................... (hereinafter referred to as the Shippers) made in conformity with the recommendations of the Imperial Shipping Committee for the purpose of maintaining regular steamship services between the United Kingdom and the Commonwealth of Australia with stability of freight and equality of rates and conditions to large and small Shippers alike.

1. The Ship-owners and Brokers agree to provide steamers to maintain regular berth sailings sufficient for the ordinary requirements of the trade from Ports in the United Kingdom to Ports in the Commonwealth of Australia both as customary.

2. Rates of freight to be the net rates ruling from time to time without primage or rebate, but subject to 5 per cent cash discount. Provided always that in cases where this Agreement is entered into with the Australian Commonwealth Line of Steamers the Shippers shall, if they so desire, have the option of making shipments concurrently in vessels loaded by any of the Ship-owners and Brokers other than the Australian Commonwealth Line of Steamers on the terms of the Deferred Rebate system instead of on the terms of this Agreement.

3. The Shipowners and Brokers reserve liberty to revise rates for individual classes of cargo as circumstances require, but they agree that no general alterations in basic rates shall be made except after consultation with the Australasian Merchants' Association and full consideration of their views thus ascertained.

4. All alterations in and additions to the Tariff of Freights to be communicated immediately to the Australasian Merchants' Association.

5. In consideration of the foregoing the Shippers agree to give their entire support to vessels loaded by the Ship-owners and Brokers as regards all shipments from Ports in the United Kingdom to Ports in the Commonwealth of Australia, and to make no such shipments by any vessels other than those loaded by the Ship-owners and Brokers unless after consultation and with their concurrence.

6. Should the Ship-owners and Brokers or any of them have cause to believe that the Shippers have not carried out their obligations under Clause 5 they shall have the right to call on the Shippers to produce satisfactory proof to the contrary.

7. In the event of any breach of this Agreement by the Shippers or in the event of the Shippers failing to carry out their obligations to confine their shipments in the manner specified in Clause 5, they shall (having regard to Clause 50 of the Imperial Shipping Committee's Report (Cmd. 1802)) pay to Messrs. ....on behalf of the Ship-owners and Brokers as liquidated damages a sum equal to the amount which they would have forfeited if their shipments made under this Agreement had been made under the Deferred Rebate system, and Messrs........................may forthwith cancel this Agreement without notice.

In the event of any breach of this Agreement by any of the Ship-owners and Brokers the Shippers shall, having regard to Clause 51 of the Imperial Shipping Committee's Report (Cmd. 1802), on furnishing proof of their loss by reason of such breach, be paid by the Ship-owner or Broker, who shall by his breach have caused such loss a sum (as liquidated damages) equal to the amount of such proved loss, but not in any case exceeding the amount which would if the breach had been committed by the Shippers have been payable by the Shippers under the last preceding paragraph of this Clause and the Shippers may forthwith cancel this Agreement without notice. Any sum so payable as liquidated damages to the Shippers shall be paid by the Ship-owner or Broker who caused the loss and shall not be recoverable or deemed to be recoverable from any other of the Ship-owners or Brokers.

8. It is agreed that in the case of large parcels of cargo not being ordinary merchants' berth cargo the Ship-owners and Brokers have liberty to quote special rates.

9. Under this Agreement the goods shall be carried on the terms of the Bills of Lading in regular use by the Steamers loaded by the Companies and Firms named in the Schedule which Bills of Lading shall constitute the Contract of carriage with the Shippers and Owners of the goods.

10. The Ship-owners and Brokers undertake not to carry cargo on ship's account except coals to fill up. The Shippers similarly undertake not to become Ship-owners or Loading Brokers in the Australian Trade from United Kingdom.

11. The Ship-owners and Brokers undertake that any Shipper who refrains from coming into this Agreement shall not be allowed to ship in vessels loaded by them on terms more favourable than would result from shipping under the existing Deferred Rebate system.

12. The Shippers shall not be deprived of their right to the benefits of this Agreement by reason of the refusal of any Corporations, Companies, Firms, or Individuals for whom they act to accept the terms thereof provided that the Shippers give notice in writing to Messrs............................of such refusal, and at the same time undertake not to claim the benefits of this Agreement in respect of any shipments made by any such Corporation, Company, Firm, or Individual.

13. This Agreement is terminable by six months' notice in writing on either side provided, however, that in the event of this Agreement not securing stability and equality of rates the Shipowners and Brokers and the Australasian Merchants' Association shall meet to discuss forthwith the situation with a view to such modification being made as may be considered necessary, and in the event of no satisfactory agreement being arrived at the Shippers may withdraw from this Agreement on giving one month's notice.

14. The Shipowners and Brokers shall be at liberty to suspend or partially suspend their obligations under this Contract in the event of any declaration of war or of war breaking out between any two or more first-class powers, or in the event of any revolution, riot, civil commotion, strike, lock-out, or labour dispute rendering it impracticable or partially impracticable for them to carry out the said obligations.

15. The parties hereto expressly acknowledge that this Agreement is to be governed by the law of England, and in the event of any difference arising between the parties hereto touching these presents or the construction thereof, or any clause or thing therein contained, or any matter in any way connected with these presents or the operations thereof, or the rights, duties, or liabilities of either party in connection therewith, then and in every or any such case the matter in difference shall be referred to arbitration. The arbitration shall be held in London or Liverpool at Ship-owners' option, and the Arbitrators and the Umpire (if any) shall be commercial men. In all other respects the provisions of the Arbitration Act 1889 or any statutory modification thereof shall apply to such arbitration.

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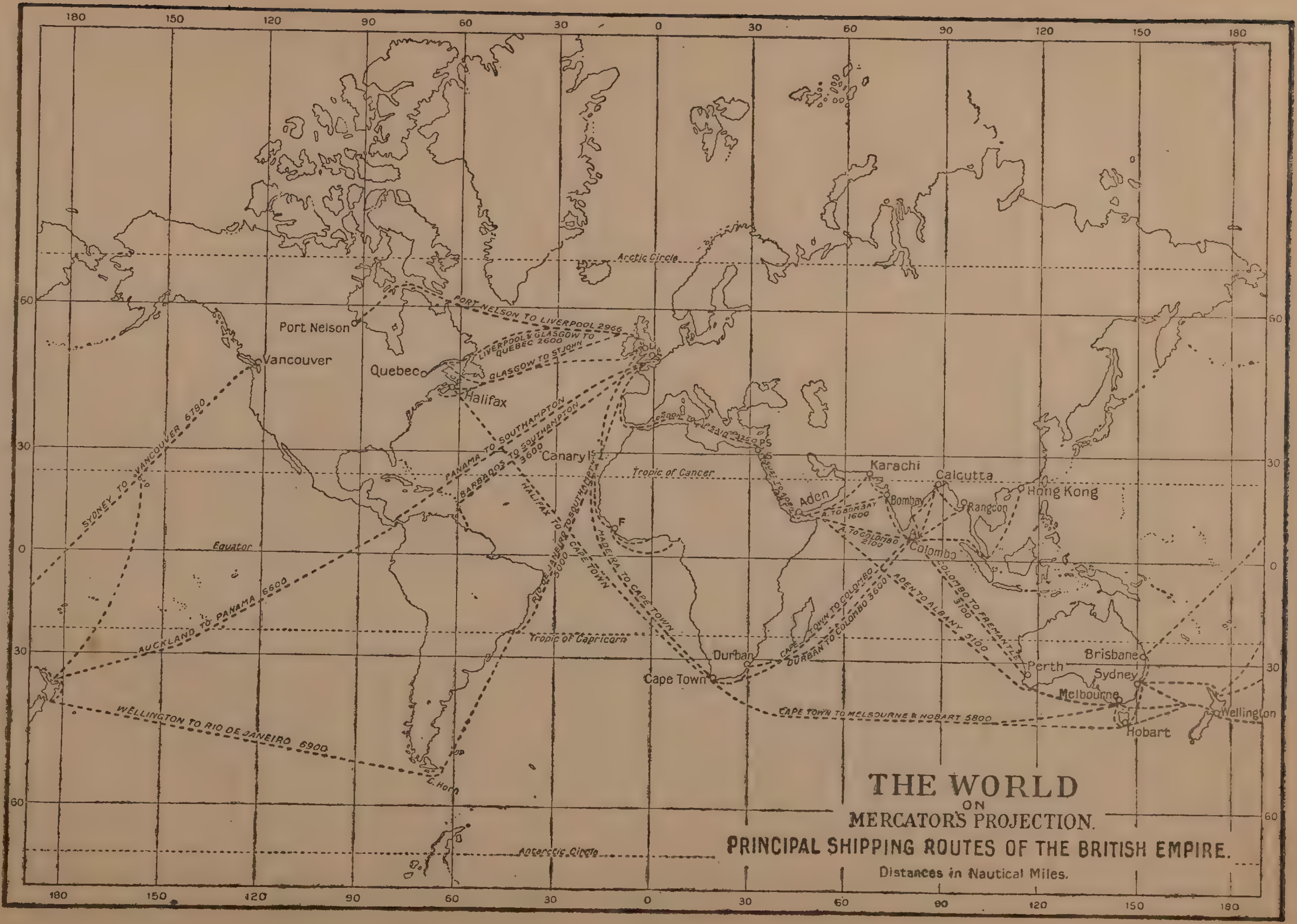
SCHEDULE OF COMPANIES AND FIRMS REFERRED TO IN THIS AGREEMENT AS THE SHIP-OWNERS AND BROKERS

The Peninsular & Oriental S.N. Company.
The Orient Line (Orient S.N. Co., Ltd.).
White Star Line (Oceanic S.N. Co., Ltd.).
Alfred Holt & Company.
British India S.N. Co., Ltd.
Commonwealth & Dominion Line, Ltd.
P. & O. (Australia via the Cape Service).
George Thompson & Co., Ltd.
Messageries Maritimes.
Anderson, Green & Co., Ltd.
Birt, Potter & Hughes, Ltd.
Aitken, Lilburn & Company.
Gracie, Beazley & Company.
Thomas Law & Company.
Bethnell, Gwyn & Company.
Trinder, Anderson & Company.
McIlwraith McEacharn's Line Propy. Ltd.
Marwood & Robertson.
J. Dowie & Company.
West Australian S.N. Co. Ltd. (via Singapore).
W. Marden & Company.
Staley, Radford & Company.
and
The Australian Commonwealth Line of Steamers.



THE WORLD
ON
MERCATOR'S PROJECTION.

PRINCIPAL SHIPPING ROUTES OF THE BRITISH EMPIRE.

Distances in Nautical Miles.

CHAPTER V

SEA ROUTES OF THE EMPIRE

WHILST the freight rates chargeable are the basis of a ship's earnings, the actual receipts depend upon the actual tonnage of goods carried. Moreover, the freight rates are themselves subject to the influence of the balance of traffics. It is not a question of values as is the case when the balance between exports and imports is under consideration. It is not a question of weights in the ordinary meaning of the term. The balance of traffics in shipping is largely, almost entirely, a matter of cargo space. In any form of transport the maximum economy is only obtainable when movement in both directions can be effected with full loads or a near approach to them. This is particularly true where the carrying unit is large, and therefore particularly and increasingly so in the case of shipping. To some extent it is relieved by the tramp, which can make circular voyages instead of out and home voyages like the liner. Thus the tramp may carry manufactures of the United Kingdom out to South Africa, load up coal at Durban for India, and there obtain a cargo of raw materials, returning to a United Kingdom port by way of the Suez Canal. Such voyages are similar to the journeys made by a railway goods wagon. The liner, however, can be compared to the great express passenger trains. Early in August the great express trains from London to Scotland are many of them run in duplicate or even triplicate, whereas on the return journey a single train suffices and then has not every seat occupied, whilst many vehicles are returned to London by empty stock trains. In just the same way at one season of the year the passenger movement is much the heavier outwards to India, whereas at another season the traffic movement is reversed. In the case of freight the seasonal variations take a different form. Many of the products sent to the British Isles by our Overseas Dominions and Colonies are agricultural, and the movement towards the United Kingdom reaches its maximum in the months immediately succeeding the harvests, gradually diminishing as the months succeed one another and the season of the next harvest approaches. The liners, which must give a service based more or less on the average traffic of the year, will be full in one direction only and then usually only at the busy season of the year. Normally there will be a moderate margin of space unused in one direction, and a more substantial margin in the reverse direction.

When the individual routes are examined, immense difficulties are encountered in arriving at really reliable facts. In the first place, the statistics of trade and shipping, which are published, are no more than rough approximations. Any conclusions based on them, which do not allow of a large margin of error in the figures without being invalidated, should be treated as at best doubtful and at most certainly unproven. Then there are no published statistics giving the cargo-carrying capacity of the ships. The net tonnage, even of a purely cargo-ship, is merely the number of 100 cubic feet of space which are supposed to be available for carrying cargo. The goods themselves are measured in tons, which may be 20 cwt., 1000 kilogrammes, or 2000 lb., in quarters, barrels, loads, or merely numbers. In many cases neither weights, nor measures, nor numbers are given, but only values. Nor is the tonnage charged for by the ship-owner any better guide. Freight may be charged by weight or measurement ton of 40 cubic feet.

To arrive even at moderately approximate results, it would be necessary to examine each route individually as regards both the shipping and the traffic. On a route which had a great passenger traffic the cargo capacity of the liners in relation to the net tonnage of the ships would be so low that it is quite possible that the measurement tons of cargo would be very little more than the net tonnage of the shipping. On the other hand, on routes where there is much bulk cargo and tramps are very active, the working capacity may be very close to the 2½ times the net tonnage given by the ratio of 100 cubic feet to 40 cubic feet. Professor Sargent in *Seaways of the Empire* assumed that every ship ton of 100 cubic feet can carry, on the average of all voyages during the year, 80 cubic feet, or two measurement tons of cargo. This was simply used as a working assumption in connection with the elaborate and lengthy calculations by which a comparison was made of the relations between the traffic carried on the chief sea-routes of the Empire and the amount of shipping working the routes in the year 1912. As this represents the only comprehensive attempt that has been published, as far as the writer knows, to equate the traffic to the shipping, some quotations will be made from the results obtained in the following pages.

When dealing with the route to South Africa, attention must first be directed to that important port of call, the Canaries. These islands lie about 1500 miles from Southampton on the route to the South Atlantic, and in pre-War days, each year about 1,000,000 tons[1] of coal was carried to these islands from the United Kingdom, chiefly for bunkering ships which are passing to or from more distant places. The South African steamers are only one lot. There are the steamers plying with South America, those going to or from Australia via South Africa, and a lesser but growing number of steamers working to and from West African ports. Of the steamers using these routes rather over half call at the Canaries.

South Africa is both a calling port for the large number of ships which are on their way to or from Australia and New Zealand, and a terminus with a substantial traffic of its own. The bulk of this terminal traffic is via the Canaries or direct with Cape Town, Durban, or Delagoa Bay as the terminal ports; only a small part passes by way of the Suez Canal. Before the War the traffic to South Africa was very considerably in excess of the return traffic, and, if all shipping had returned direct, there would have been a good deal in ballast, beside much light trading. The absence of ships in ballast is explained by the fact that many ships go on to India. India needs more coal than she produces and South Africa produces coal of a good quality at a low price. From Natal collieries alone about 1,000,000 tons are sold annually for bunkers, and an amount, which is approaching this, is sold as cargoes for export.[1] This export trade is growing, and so tends to make the return route via India, where cargoes for Europe are often available, and then home by the Suez Canal more attractive.

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[1] In 1922, only about half this quantity was exported to the Canaries.

There has, however, been some change since the War. Mining development has been less active in South Africa, and so there has been a reduction in the heavy outwards traffic in mining machinery and other equipment and supplies for the mines. At the same time, there has been development in the exports of agricultural products, which occupy a substantial amount of shipping space. Formerly the exports, though exceeding the value of the imports by some £24,000,000, were gold, diamonds, and ostrich feathers to the extent of 75 per cent of the value. These do not make freights. The growth in agricultural products, by reducing the imports and increasing the exports, is reducing the adverse balance. It is, however, only in the maize crop season that the exports of South Africa may exceed the imports, but the bulk of this seasonal traffic is shipped by steamers outside the regular lines. So long as the return cargo is short, the ships must depend mainly for their profit on the outward journey, and freight rates to South Africa will tend to be high. But with the development of a good return traffic, the rates may be expected to become as favourable as on other routes, where the traffic is balanced more evenly.

At the present time and for many years the principal cargo route to Australia has been via the Cape. The distance by this route differs by about 1000 nautical miles from that by the Suez Canal, and the advantage of being able to coal cheaply has proved the determining factor. Until the development of South African coal, it was necessary to bring Welsh coal to Cape Town. This long voyage made the price of coal high, and so ships would often coal at the Canaries rather than at the half-way point to Australia. So South African coal has had several effects on this route. It has reduced the tonnage using it, as it has practically killed the traffic in Welsh coal to South Africa. It has diminished the ships calling at the Canaries for bunkers. It has been an important factor in encouraging the use of this route against the Suez route. The Suez route outwards is used mainly for the mail steamers. It might prove an interesting speculation to trace the possible effects of the extended use of oil fuel for marine propulsion. If oil should not be found in quantities in South Africa, whereas there is a large production in India and near the Persian Gulf, with vast resources in the latter region still to be developed, oil-using vessels may find it advantageous to transfer to the Suez route. On the other hand, coal now shipped for bunkers at South African ports will be available for cargoes, and so a new demand for shipping will be created.

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[1] The amount of coal sold for export as cargo was considerably over 1,000,000 tons in 1923. The large increase was due to the dislocation of European coal markets through the occupation of the Ruhr by the French.

Not all the outward bound ships for Australia call at a South African port. Of the total stream of merchant shipping either passing or calling, about three-fifths, Professor Sargent estimates, is in transit eastwards, and, except for that from the East Coast of North America, is not concerned with the local trade of South Africa.

The return traffic from Australasia is less easy to trace. The amount of shipping entered at ports of the United Kingdom as from Australasia is about the same as that cleared to that region. This suggests the conclusion that Australasia is able to provide homeward cargoes for all the ships going outward in the direct trade. There is a material difference in the distribution by routes. Nearly one-third comes by the Cape, rather less via Cape Horn, and about 40 per cent via Suez. The explanation of the difference is largely due to differences in the outwards and homewards cargoes. On the homewards journey there are many full cargoes to be obtained direct from New Zealand, and the ships carrying these regularly traverse the route via Cape Horn, which route is 1000 miles shorter than the route via Suez. The Panama Canal has had little effect on this as, whilst the route is 500 miles shorter than that via Cape Horn, the canal charges and the length of time needed to traverse it more than counterbalance the advantage of the distance. As regards the Australian trade, rather more than half the tonnage returning direct follows the route via Suez. This is partly due to the need for regularity in the arrival of Australian wool. Formerly the Cape route, owing to the strong westerly winds and gales, was markedly more irregular than the Suez route, but, though this is rather a tradition of the past, the custom of sending by the latter still maintains. At the same time, from the ship-owners' point of view the Cape route has disadvantages on the return journey which do not exist on the outward. If the same course is followed as on the eastward voyage, the ship has to encounter the full force of the westerly winds, which mean either extra time on the voyage with some extra fuel consumption, or the consumption of a considerable amount of extra fuel. Ship-owners, in consequence, find it most economical, in order to get better weather conditions, to take a more northerly course, which increases the mileage. This necessarily increases the journey time and the cost of running, so whatever course is followed, the voyage westwards by the Cape takes longer and costs more than the voyage eastward. This makes a substantial deduction from the advantages which were shown to belong to the Cape route on the outward voyage, and which largely offset the extra thousand miles the ship had to traverse.

It is well known that the loads in relation to the tonnage in the Australian trade are normally good. Professor Sargent estimated that in 1912 the load-index outwards was about ·53 per cent, a much better figure than the ·35 per cent which he estimated on the same basis for the South African outward trade. The return cargoes, as has been pointed out, are mainly bulky. The principal exports of Australia are wool, wheat, skins, and hides, and certain metals in ore or ingots, apart from butter and meat, which require refrigerator vessels. The estimate of the load-index in this direction was about ·7. This more favourable figure on the return journey is partially met by the difference between the out and home passenger traffic. There is a practically unbalanced emigrant traffic to Australasia, which from 1920–22 averaged about 50,000 a year, but from 1911–13 averaged 85,000, a figure which it is expected will be exceeded in the three years from 1923–25. The Australian trade is thus from an all-round shipping standpoint rather exceptionally well-balanced on the whole.

The balance is not from a working point of view quite as good as the averages represent. The exports from Australia present decided seasonal features. Wool, which represents about 40 per cent of the export in value and being bulky takes up a large amount of cargo space, is chiefly forwarded between September and March. Wheat, another substantial trade, is despatched as rapidly as possible after the harvest. There is then a material difference between the cargoes offering at the different seasons of the year. As the trade with the United Kingdom is conducted very largely by liners, there is the feature of an irregular trade being conducted by regular steamers. This makes for expensive working, and acts on freight rates in the reverse direction to the good average loading that has been noted.

It has already been noticed that some ships, after discharging in South Africa, proceed with coal to India. The records show that there are a certain number which proceed under ballast to Australia. These ships are not required for cargo to the United Kingdom. They probably supply some of the tonnage necessary to take the traffic sent direct to the European continent, and perhaps also take cargoes of coal which Australia exports in substantial quantities to India, the islands of the south-east of Asia, and New Zealand. This is rather less than half the coal exported, so the balance, though chiefly carried in British ships, goes to Chile and other places outside the British Empire.

Turning next to the trade with India, and the lesser parts of the Empire in Asia, and British East Africa, the route taken is through the Mediterranean, the Suez Canal, and the Red Sea. This route to India is 4000 miles shorter than the old sea route by way of the Cape. The opening of the Panama Canal has in no way affected the advantage of the Suez, as even to Hong-Kong the Panama route[1] is over 4000 miles longer than the Suez route. The transit of the 99 miles of the Canal is of course slow. A single ship with a straight run through would take about ten hours, but, when tying-up has to take place to allow other ships to pass, the time taken may be several hours longer. The

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[1] The effect of the Panama Canal on sea routes between different parts of the Empire is very limited. New Zealand is about 1,600 miles nearer to Liverpool via Panama and Tahiti than by the route usually traversed via the Suez Canal. The Eastern coast of Canada is brought materially nearer to Australasia, the gain over the Cape route to Australia varying from some 1,500 to 3,500 miles, whilst to New Zealand the gain is 5000 miles via the Cape and 3000 miles via the Straits of Magellan. The chief effect on British trade and so on British shipping is due to the great reductions in the distances from New York and other ports on the east coast of the United States. Whereas, prior to the opening of the Canal, New York was considerably further than the chief U.K. ports from the principal Australian ports, the position is now reversed. Wellington is now 4000 miles nearer New York than Liverpool, and Sydney 2,500. Adelaide roughly marks the dividing point, as the 200 miles it is nearer is insignificant in a distance of 11,000 miles. The manufactures of the Eastern United States are thus in a much more favourable position to compete with the manufactures of the United Kingdom in the Australasian market than formerly.

Canal has been frequently improved and enlarged. The bottom width, which was originally only 72 feet, has been increased until it is now 147 feet. This has meant that tying-up has been very much reduced. The depth also has been improved. Beginning with a depth of 26 feet, which would allow of a ship's draught of 21 to 22 feet, the depth has been increased by stages so that any vessel not exceeding a 31-foot draught can navigate the Canal. The work of deepening the Canal is still going on so as to meet the increasing size of the vessels which economy in ocean transport demands. It may be noted that canal dues and tolls are nominally levied on net tonnage, but it is a net tonnage calculated according to rules which are peculiar to the Canal. There is not a single Power, the ships of which pass through the Canal, whose rules for calculating net tonnage do not give a materially lower figure than the Canal's rules. The net tonnage of shipping making the passage of the Canal fell during the War to the level at which it stood twenty years earlier. The recovery was rapid, and by 1921 the tonnage was practically the same as in 1911, but still 2,000,000 tons below that of 1912 and 1913. There is, however, a great change in the number of ships passing through. In 1911 the number was 4,969, whereas in 1921 it had fallen to 3,986 ships, a fall of 20 per cent. This reflects the increase in the size of ships which has taken place during the intervening period. Of the ships traversing the Canal about 60 per cent fly the British flag.

India is the best customer the United Kingdom has for her goods. As the exports to British India included in 1922 some 800,000 tons of iron and steel manufactures and machinery; 1,000,000 tons of coal; large quantities of cement, cotton yarns and piece goods, paper, soap, with many other miscellaneous manufactures, there is ample cargo for a considerable amount of shipping. Professor Sargent calculated that in 1912, with some 3,500,000 tons of shipping space available, the load-index for the Indian Ocean generally was about ·76. Whilst competition exists in the trade to the Far East, the trade to British India and Ceylon from the United Kingdom is practically a monopoly of British ships. There is then clear evidence of a profitable outwards trade to our Indian Empire.

As regards the return trade, though the value of the goods exported from India to the United Kingdom is substantially below that of the goods imported, the character of the goods is so different that a much larger quantity of shipping is needed. There are heavy exports like manganese ore, but the greater part of them consists of more bulky commodities like wheat, rice, tea, cotton and flax seeds, and jute. Tea is the only one of these commodities which is of high value in proportion to its bulk. Roughly 1,750,000 tons more of shipping are needed in the homewards direction across the Indian Ocean. About half of this is supplied by shipping that has brought coal to India from South Africa and Australia, whilst a large part of the balance comes in ballast through the Suez Canal, much of it having carried coals to Egypt, to which country the United Kingdom despatched about 1,750,000 tons in 1922. Professor Sargent found a load-index of nearly 1·0 in 1912. The region is obviously marked out as attractive to the tramp steamer, and it is easy to understand that it should have proved to be the pioneer in the introduction of the Conference system and the deferred rebate.

India is so vast that it is worth while noting the difference between the Western and Eastern sides. From Calcutta the total clearances of ships are less than the tons entered. The clearances to the United Kingdom from Calcutta, however, almost exactly balance the tonnage entered, so the surplus is not in the United Kingdom trade. From Bombay and Karachi the cleared ships exceed those entered by over half-a-million tons. This additional tonnage, due largely to the demand for the wheat from Karachi, and the wheat, cotton, and seeds from Bombay, is provided by the ships coming in ballast from Suez. Confirmation of this is found in the entries in ballast at these ports, which are substantial. Naturally empty ships from Suez would seek the nearest cargo, and avoid the considerable extra mileage to the east side of India if possible. Of the British tonnage coming through the Canal from India and its neighbourhood in pre-War days only about three-quarters was shown with the United Kingdom as its destination. The remainder made for the ports of France, Belgium, Holland, and Germany. The depressed condition of the European exchanges has reduced the capacity of Western Europe to purchase Indian goods, so that these proportions have been materially altered. It is quite impossible to say whether the proportions will ever be restored, as by the time the European exchanges have become stabilised other factors may have arisen which will permanently affect the situation. It has been perfectly evident that, as elsewhere, coal is a big factor in helping to balance the large tonnage required for the carriage of the Indian exports to the west. As has been mentioned earlier, the growing use of oil as a marine fuel may change the whole situation. A very large part of the coal shipped to Egypt from the United Kingdom is for bunkering ships. If the ships burn oil instead of coal, the fuel will naturally come from the Persian Gulf, or India, if it comes through the Canal, or it may come from the European oil fields, which would ship it at Black Sea ports. Clearly there are too many uncertain factors to be able to draw any certain conclusions as to the future balance of shipping on the United Kingdom and India route.

The one remaining great route of the Empire is that across the Atlantic to Canada and Newfoundland. This is by far the worst-balanced sea route of the Empire. Not merely does the United Kingdom import from Canada and Newfoundland to twice the value of the goods she exports to them, but, whereas the latter are mainly manufactured goods which occupy a very moderate amount of cargo space compared with their value—two-thirds being iron and steel, and other manufactured goods—the former consist for the most part of grain, timber, pulp, flour, cheese, apples, and other comparatively bulky goods. It is safe to say that the shipping space required for the imports is more than four times that needed for the exports. The result of this is shown in Professor Sargent's computations that in 1912 the load-index outward was rather less than ·19, whilst on the homeward journey, " after allowance for transit traffic through the United States, and for the competition of a few foreign ships," the load-index was about ·7. As in the case of Australia, it is necessary to consider the passenger traffic. The movement in both directions is considerable, but the net emigrant movement to British North America is always substantial. It is, however, very variable. In the three years 1911–13 the high average of 189,000 emigrants was reached, but this figure has never been approached since the conclusion of the War, and in 1922 the emigrants only numbered 42,600. In any case, whatever be the addition which should be made to the load-index for the passenger traffic, it is evident that the average direct voyage for outward ships must be far from profitable. There does not seem to be any great prospect of improving the balance of traffic materially. As the population of Canada increases by immigration, her power of production increases. The surplus of grain and similar products for export will increase, and will continue to occupy more shipping than the corresponding increase in her imports of manufactures. Moreover, Canada is pursuing the policy of encouraging manufactures within her own borders. Apart from this, her proximity to the United States tends to make her adopt United States standards rather than British standards on her railways and in her manufacturing methods. This makes it natural that the immediate neighbour should supply much of the material and equipment which Canada is unable to manufacture for herself. Even the preference given in her tariff to productions of the Empire is only able to counteract this very partially.

It is not possible to leave the trade with Canada without referring to that with the United States, which is so closely linked with it, particularly in view of the great increase which has taken place in the mercantile marine flying the Stars and Stripes. A British vessel crossing the Atlantic may take a cargo for more than one port. If one port of call be Canadian, the ship can fill up with cargo for the next port if there is cargo available. If, however, it is a United States port, the vessel cannot load up for the next port of call if that is also in the United States. The ships flying the United States of America flag enjoy a monopoly of the port to port traffic of that country, which it can link up with traffic between two Canadian ports or between a Canadian port and a United States port, or between a United States port and any other port whatsoever. This probably affects British shipping running along the West Coast of North America most, though it is not without a material influence on the Eastern side, where shipping may wish to pass between the Gulf ports and the more northerly ports.

Briefly stated, the coastwise liability gives the American ship-owner a solid protected basis upon which to build a service, which can be further sustained by open competition for cargo traffic in unprotected fields. This advantage, together with the ability of the Shipping Board vessels to place their losses on the back of the taxpayer, appears to give many of the United States ship operators an advantage which, but for other disabilities, should enable them to cut rates against British and other European shipping competition in the unprotected fields of ocean transport. A prominent ship-owner has expressed the view that "if the American mercantile fleet were deprived of all forms of subsidy, and of this coastwise law, it would be utterly unable to make any sort of showing against European ship operators, because the position would then be that almost any and every United States citizen would be able to earn a much more attractive livelihood in shore operations than by following any business directly associated with what would then be so highly competitive a career as the ocean transport business, either overseas or coastwise. Subsidies (in varied form) in conjunction with coastwise trade protection and the undoubted genius of Americans for organisation and mass production of goods or services are a formidable combination. The last-mentioned factor would not alone be sufficient to keep the American flag flying in so many oceans."

There are many liner routes of the Empire which have been ignored, or only incidentally mentioned. The routes from the United Kingdom to the British West Indies and West Africa are two instances. Both yield a low load-index outward, and ship-owners depend mainly on the return trade for their profits. Then there are many ships making voyages from one of the Dominions or Colonies to another. The trade between Australia and New Zealand is substantial, but of the greater distances the largest developments have been with India—Australia, New Zealand, and South Africa each purchasing goods from India to a substantial amount, and sending goods in return; coal, as already noted, forming a substantial part of the latter. Canada too sends goods in some quantities to South Africa, Australia, and New Zealand, but except in the case of the last-named the return quantities are small. In contrast the goods shipped from India, Ceylon, and that region nearly equal in value the goods shipped to South Africa and Australia together, whilst Canada sends very little in return. These routes are chiefly served by liner services working on the great routes already noticed, or by ships working on round routes, and not directly to and fro. Another route which is important is that between Canada, the West Indies, and British Guiana. Canada imports sugar from this region on a considerable scale, as well as other products, and exports goods to about half their value. The carrying of this trade can hardly be separated from the large trade up and down the East Coast of North and South America, of which it forms a part. The Canadian Government Merchant Marine, Limited, is, however, endeavouring to organise regular line services to deal with these trades with the other British Dominions and Colonies.

UNIVERSITY COLLEGE NOTTINGHAM

CHAPTER VI

PORTS AND DOCKS

Shipping is essentially dependent upon inland transport for the collection and distribution of its cargoes. The connection between the two is made at the ports—docks, quays, wharves, and barges being the equipment of the port which provides the connecting link. A striking feature of the twentieth century has been the rapid increase in the size of ships. Shipping is no exception to the modern conception that for the most part the greatest economy is only achievable when operations are on a large scale. So, subject to certain qualifications, it is true to say that large ships mean cheap ships, but it is even truer to say that deep ships mean cheap ships. Moreover, the demand for increasing speeds in the ships that carry the passengers, mails, and general merchandise overseas cannot be attained without excessive cost with small steamers. It is only by increasing the size of the ship that this requirement of modern commerce can be met at a cost which commerce can afford to pay. The greatest obstacle to the growth of ships is the capacity of the ports which they visit. Many ports were constructed in the days of small ships and it is a practical impossibility to adapt them to the length and draught of the modern large vessel. Length is usually a lesser difficulty than depth. A port situated where the five-fathom line at low water does not come moderately close in to the shore, is so limited that it will soon have to confine itself to coasting and other short-distance trades. Even if the depth at high water is substantially greater, the element of time is so important to-day that a port, which can be entered and sailed from only for a limited part of the day is severely handicapped. The capital value and the daily working costs of the great liners of to-day are so huge that the loss of a few hours may appreciably diminish the profits. Ships are often required to turn around in such a short time, that delay in berthing can only be made good by excessive expense over unloading and reloading.

A large number of the great ports of the world have to-day an effective minimum in the neighbourhood of 30 feet at low water, whilst there is a smaller number which have an effective depth of 40 feet more or less. Just as the Suez Canal has been deepened to 36 feet, and so can be traversed by ships drawing 32 feet, so the tendency is to increase the depth of water at the ports as far as is practicable towards the 40 feet standard. The United States has shown more enterprise and foresight than has been exhibited by most of the harbour and port authorities of the United Kingdom and other parts of the Empire. Beginning with the Panama Canal, which has a minimum depth of 41 feet, a 40-feet depth exists at Boston, New York, Tacoma (Washington), Seattle, Astoria; whilst at San Francisco, though nominally the depth is only

35 feet, ships of 33-feet draught have been docked at the wharves on several occasions. It is not everywhere that the provision of deep water has been difficult or costly. Some harbours, Sydney, for instance, have had good natural conditions from the outset; others, like Glasgow, have literally been created ports, and even the moderate depth of 27 feet has only been attained at great expense. In such cases improvements are often increasingly costly. In the case of the Clyde it has been stated that above Dumbarton no greater depth than 30 feet is practicable "as it would mean reconstruction of the quays and widening the river along banks which to a large extent are permanently occupied by private enterprise." Even to obtain a 30-feet depth "all existing quays will require renewal, except the modern ones already giving 28 feet (L.W.O.S.T.)"[1]

For a time the ship may be adjusted to the port, but in the great majority of cases an alternative port suited to the larger type of ship will become available, and then trade will gradually leave the port. Ultimately the port must be adapted to the steamer, just as the road must be made to suit the vehicle. The saving grace for the port has often been that whilst the port must be made to suit the ship, the ship must in its turn be suited to the trade. The demands of trade for the largest ships are likely to be limited always, and so the fact that not a large number of ports can attain great depths at a cost which can reasonably be faced is not very serious. Probably no port which it is practicable to deepen to 40 feet, so that ships of 35-feet draught can be dealt with, need fear the future for many years to come.

It is well then to look at the principal ports of the Empire from this point of view. Starting from London the low water depth of channel is no more than 30 feet, but only the lower reaches are as much. The rise of the tide, however, gives a depth at H.W.O.N.T. of 37 to 35 feet. The principal accommodation consists of enclosed docks. The Tilbury and Royal Albert Docks both have quayage with a depth of 38 feet, and an extension of the former is contemplated to have a depth of 43·6 feet (H.W.O.N.T.). It is improbable that the channel would be deepened at reasonable cost to a standard of 40 feet (L.W.O.S.T.), so that the limitations imposed by the tide will always exist. Liverpool has to face the existence of a bar at the entrance to the River Mersey. This has been dredged to a depth of 32 feet (L.W.O.S.T.) As the rise of ordinary neaps is over 21 feet, there is an ample margin for a large part of the twenty-four hours. The largest and new Gladstone dock has a depth of 39 feet (H.W.O.N.T.), whilst there is an extension in progress which will take four vessels of 1000 to 1100 feet in length and at least 42 feet draught. Southampton is a port mostly of open docks and quays with an approach channel having a depth of 35 feet (L.W.O.S.T.), and of 44 feet 6 inches (H.W.O.N.T.) The depth of the channel could be increased to 40 feet (L.W.O.S.T.) at a moderate cost and without causing a great additional expense for maintenance. The maximum available depth is 40 feet (L.W.O.S.T.) at the White Star unenclosed dock. There is thus no serious obstacle in the way of maintaining this port to take the largest vessels existing or contemplated.

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[1] Dominions Royal Commission, 1917, p. 8. (Cd. 8461.)

Glasgow has already been referred to. It must be classed as a 30-foot port, no depth above this being contemplated. Bristol is in better plight. The Bristol Channel is navigable to the mouth of the Avon by the largest vessel at any state of the tide. The depth at the entrance channel is 38 feet (H.W.O.N.T.). At present ships exceeding 32-feet draught cannot be berthed. The depth of water at the berths could readily be increased to 38 feet, but reconstruction of the entrance lock would be necessary. Of the South Wales ports—Cardiff, Newport, and Swansea—all are dependent on the tide, as the approach channels have only a few feet of water at low tide. The two first get a depth of about 35 feet (H.W.O.N.T.), whilst Swansea has only 25 feet 6 inches. At the Queen Alexandra Dock at Cardiff 40 feet depth can be obtained at high water of about 200 tides in the year. It is quite clear that these ports must remain dependent very largely on the tides, as the amount of deepening necessary to get a deep channel at low water would be so great as to be impracticable. Two other ports in this western area require notice, Belfast and Manchester. At Belfast the channel is at present dredged to a depth of 22 feet 6 inches (L.W.O.S.T.), but the rise of the tides bring it into the 30-foot class of port. The channel could be deepened to 40 feet (L.W.O.S.T.) at a moderate cost, and, if done, maintenance charges would not be increased to any considerable extent. Belfast can clearly be made a port of the first rank, though it is not probable that the general trade of the port will require this. The shipbuilding industry, however, may, as some of the largest vessels in the world have been built and fitted out at Belfast.

Manchester is an entirely made inland port, which only came into being through the construction of the Manchester Ship Canal. The entrance channel to the canal entrance lock has a navigable depth of only 11 feet 9 inches at L.W.O.S.T., so that only ships of small draught can enter and leave at all stages of the tide. The depth in the canal is 28 feet and the same depth is found at the Manchester Docks. No increase in the depth is practicable at any reasonable cost; so that Manchester must be considered as permanently limited to vessels of the size with which it can now deal. As the length of the canal is 35·5 miles, the time taken to traverse its length is a handicap which will always limit the number of vessels using the port. In spite of this the tonnage of ships entering and clearing exceeds 3,000,000 tons, so that it takes rank as the twelfth busiest port of the United Kingdom.

Turning to the East Coast ports, the channel of the Tyne has been dredged to a depth of 30 feet (L.W.O.S.T.), but the maximum depth of loading berths, 26 feet (H.W.O.N.T.), is found in the Tyne Dock, though 30 feet (L.W.O.S.T.) exists at one coal-shipping staithe. The engineer to the Tyne Improvement Commissioners has stated that there is no insuperable difficulty in deepening the channel in the lower portions of the river to 40 feet (L.W.O.S.T.). Vessels of the largest size are built in the shipyards on the Tyne, but, owing to difficulties in navigating the river, it is improbable that the largest ships will ever use the Tyne when under load.

Coming down the coast to the Tees, the port of Middlesbrough is handicapped by the depth of the channel. This, however, is being improved to 20 feet (L.W.O.S.T.), and with a rise of the neaps of 12 feet it will be able to be classed as a 30-foot port. The depth of water in the dock is 27 feet (H.W.O.N.T.), but the London and North-Eastern Railway propose to build a riverside quay with a depth of 30 feet (L.W.O.S.T.). This quay will take vessels 700 feet long, the longest vessel that could with safety be brought up and turned round in the river. On the Humber are the docks and quays and jetties at Hull and Immingham. The channel of the Humber is wide, and the depth varies from a maximum of 60 feet to a minimum of 30 feet. The minimum depth of the main channel opposite Immingham is 39 feet (L.W.O.S.T.), and both here and at Hull the approach channels can be deepened to any extent required. At present the depth of water at the entrance lock of the King George Dock at Hull is 33 feet (H.W.O.N.T.), though inside the dock a maximum of 38 feet is found, whilst Immingham is limited to 31 feet 6 inches at neap tides. Both ports can be added to the group of 30-foot ports which can be converted into 40-foot ports if trade requires.

Turning to South Africa, the depths L.W.O.S.T. only differ by 3 feet to 4 feet from the depths H.W.O.N.T., so there are no enclosed docks. The maximum depths at the quays L.W.O.S.T. are: Capetown, 38 feet; Durban, 38 feet 6 inches; East London, 27 feet 9 inches; and Port Elizabeth, 21 feet. Port Elizabeth is really an open roadstead and vessels ordinarily lie at an anchorage with 36 feet (L.W.O.S.T.) They can, however, lie in equally secure anchorage with up to 8 fathoms of water. East London could be deepened to 40 feet, but the cost would be considerable and would entail large maintenance costs afterwards. Moreover, it would be very costly to secure an adequate turning basin for large ships. East London is likely to remain a 30-foot port. Cape Town and Durban are in process of being made into 40-foot ports, and the new graving dock at the latter, 1150 feet long, 110 feet wide, and 41 feet deep, is so far advanced that it is expected to be in working order before the close of 1924.

Following on the route to Australia, the following are the available depths, L.W.O.S.T., at quays at the chief ports :—

Adelaide	35 ft.	Hobart	40 ft. to 60 ft.
Brisbane	28 ft.	Melbourne	37 ft.
Fremantle	30 ft.	Sydney	50 ft.

In the case of the last named the channel is only 40 feet deep, with a rise at neap tides of only 4 feet 6 inches. Melbourne has 40 feet of water in the channel, but as 8–10 feet have to be allowed for "scend," the safe navigable depth is about 32 feet. Steps are being taken to improve this by 3 feet, but it is a slow process. A 50-foot depth which would be necessary for vessels having 40 feet is quite practicable at moderate cost, but it is estimated that the work would take thirty years to carry out. Both Adelaide and Fremantle could be dredged and added to the 40-foot ports, there being no engineering difficulties in the way. The River Brisbane could be developed to a depth of 35 feet, and its development to 30 feet is contemplated. Owing to Brisbane being an end port a vessel usually draws 4 feet to 5 feet less water when there than it required at Sydney. So long as the present system of working continues Brisbane can have several feet less depth than the other Australian ports and still deal with the same size vessels.

The New Zealand ports, owing to the small rise and fall of the tide, have quays and wharves, and enclosed docks are unnecessary. The four principal ports have maximum depths (L.W.O.S.T.) at the berths as follows :—

Auckland . . .	26 ft.	Lyttleton . . .	32 ft.
Dunedin (Port Chalmers).	30 ft.	Wellington . . .	36 ft.

Vessels with a draught to within a foot of these depths can be berthed at each. All these ports, it is reported, can be deepened in a few years to provide 40 feet of water at berths and a corresponding depth in the channels at a reasonable cost and without entailing more than a moderate to small extra cost for subsequent maintenance. New Zealand is clearly in a very favourable position to meet any future increase in the size of shipping[1] which may be employed in her trade.

Turning to India and the Eastern Colonies with the limitations imposed by the Suez Canal, 40-foot ports are not to be expected unless they are natural. Aden has a depth of 30–31 feet (L.W.O.S.T.) and Karachi of 29 feet. Bombay in the Alexandra Dock has a depth of 36 feet 3 inches (H.W.O.N.T.), but owing to the lack of water in the approach channel vessels drawing 25 feet are the largest which can enter and leave at any state of the tide, and during the monsoon season 27 feet represents the maximum draught for any vessel. Calcutta is limited by the Hooghly to vessels of 30-foot draught as a maximum, but vessels of 25-foot draught and over suffer considerable delay coming down the river. This it is hoped to abolish by further dredging. The port itself has deeper accommodation, as alongside the Garden Reach jetties the depth is 40 feet at low water. Madras is a 30-foot port, as is Colombo. A portion of the harbour at the latter can be deepened to 40 feet below L.W.O.S.T. at a small cost, but at present the maximum depth is 33 feet, though the work of increasing this to 36 feet is in progress.

Rangoon, the terminus of the Burma railways, has accommodation for ships up to 34-foot draught, but the depth on the bar prevents ships drawing more than 25 feet from entering and leaving at all stages of the tide. Singapore is an unusually fine port. The approach channel has a depth of about 60 feet (L.W.O.S.T.), and ships up to 45-foot draught can discharge and load with ease and despatch alongside jetties and wharves at all times. Hong-Kong is a port of the same class as the last-named, the approach channels having a depth of 60 feet (L.W.O.S.T.) The bulk of the shipping lies at mooring buoys, and four of these are capable of taking vessels 1000 feet in length, any beam, and 40-foot draught.

Looking across the Atlantic to Canada, Halifax, the winter port when the St. Lawrence is frozen, is a fine harbour, which can be entered at all times by the largest vessels. A depth of 40 feet is found alongside quays at low water, and there is a scheme on foot for increasing this to 45 feet, a depth which already exists for some distance at the water end of the quays. Quebec depends on the River St. Lawrence for its approach. The limiting bar is found at the traverse about 60 miles below the harbour. Here the channel is an artificial one dredged to a depth of 30 feet (L.W.O.S.T.), which gives a depth of 43 feet (H.W.O.N.T.). There is a substantial amount of quayage at which ships drawing 40 feet of water can be berthed, so the port is capable of dealing with the largest types of vessels. Montreal is a more restricted port, as in spite of dredging between Murray Bay and Montreal, the depth of the channel at low water is 30 feet. The tide gradually diminishes above Quebec, and is lost in Lake St. Peter, half-way to Montreal. The draught of vessels is in consequence limited to 33 feet in the spring and to 27½ feet in the autumn. There is a depth of 35 feet at some of the piers and wharves and this is ample until a deeper channel is dredged. St. John (West Brunswick), the Atlantic terminus of the Canadian Pacific Railway and one of the termini of the Canadian National Railways, is another winter freight and mail port for Canada. The channel is 32 feet at low tide, and 53 feet 6 inches at H.W.O.N.T. The maximum available depth at the quays is 32 feet, providing for vessels of 30-foot draught. To deepen the channels appreciably would be very costly, and nothing in this way is likely to be attempted, as there is already a depth in excess of 40 feet in the channels at less than half tide. St. John's (Newfoundland) is a harbour easy of access and perfectly safe inside, of which the entrance has a depth of 36 feet (L.W.O.S.T.), whilst a similar depth is found at the wharves. As the neap tides give a rise of 2 feet 9 inches above L.W.O.S.T., it is thought that it would be costly to provide a depth of 40 feet. Canada on the east is thus in a favourable position as regards her ports for meeting increases in the size of ships.

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[1] New Zealand has an excessive number of small ports, at which vessels are expected to call. The numerous calls inevitably raise the level of freights.

Crossing over to the West Coast of Canada, Vancouver has a fine harbour with a depth at low water of 38 feet at the entrance, and a minimum of 43 feet at high water. The maximum depth at any wharf is 35 feet at low water. It is agreed that this port could be brought up to the 40-foot standard, but no estimate has been made as to whether this could be done at a reasonable cost. Prince Rupert at present has a maximum depth of 35 feet at the wharves, but it could easily be altered to provide for vessels of much greater draught. The approach channel has a depth of 74 feet, and so rapidly does the depth increase from the fronts of the wharves that an extension outwards of the wharves from 10 feet to 20 feet would give a depth of 40 feet, and a little further out the depth is 60 feet. British Columbia has a third port of considerable possibilities in Victoria. It consists of an inner and an outer harbour. The former has only 20 feet at low water. The latter can be approached by most vessels at any state of the tide as there is a minimum depth in the channel of 30 feet, and the wharves are dredged to a depth of 35 feet. The channel is also being dredged to the same depth, and it has been reported officially that a depth of 40 feet is quite practicable, though no estimate has been made of the probable cost.

It is clear that the British Empire possesses a considerable number of ports which are now, or are capable of being altered to, 40-foot ports. If the traffic should justify the use of steamers requiring such a depth of water more generally, the possibility of employing the vessels economically will depend in many cases on whether a sufficiency of the ports have been deepened to allow the vessels ample choice in selecting points of origin and of destination for their cargoes. If a steamer is limited to a few large ports, it loses flexibility and something of its efficiency. Such loss may more than counterbalance the economy which the size of the ship gives, and it would be lamentable if such economy were to be lost for lack of foresight in deepening the ports where such can be done at reasonable cost.

Important as this feature of depth of water at the ports is, it is of equal importance that the ship should be turned round quickly at the port. The ship as a means of conveyance is economical ; as a warehouse, very costly. This is true of practically all modern means of transport and the contrast tends to become greater the more costly the transporting machine becomes. The motor vehicle is a more economical means of conveyance on the road than the horse dray, but as a warehouse it is more costly and most extravagant. The loss of a day will run with the modern steamship of good size into several hundred pounds. The saving of a day in port time after time may in the course of a year result in an additional round voyage. From the port point of view rapidity in dealing with the ships is equally vital. Docks, quays, and wharves are costly to provide, and as certain port and dock dues are commonly levied on tonnage, rapid turn-round of ships by increasing the possible tonnage permits the necessary revenue to be obtained with lower dues. This also tends to make a port popular with merchants and ship-owners alike. The recognition of this has resulted in the use of many mechanical appliances for handling goods at the quayside, and such equipment is being more and more recognised as essential to success. Yet there are still many ports, including some of the greatest judged by the tonnage of shipping using them, which continue to use out-of-date and rudimentary methods and appliances in spite of their manifest inefficiency. The criticisms levelled at a number of the ports of the United Kingdom have been so severe of late, that at the moment of writing a shipping commission is visiting many of the ports with the object of inspecting and criticising their equipment and appliances.

This failure to bring ports up-to-date in their equipment may be attributed to a variety of reasons. In some cases labour has been inclined to take the view that labour-saving appliances by reducing employment were from their standpoint undesirable. In some cases the conservatism in a trade has been such that a new appliance has been installed and then practically unused. An experience of that kind tends to make the dock owners think many times before incurring further expenditure on modern appliances. In some cases the finances of the docks are not sufficiently flourishing to enable the owners to launch out. Several of the great railway-owned docks in this country passed into railway ownership entirely on this account, the railway company purchasing to prevent the decay of the port and the subsequent loss of traffic to themselves.

The matter of cargo-handling appliances was discussed at length at the

International Navigation Congress held in London in July, 1923, and ultimately the following resolutions were adopted unanimously :—

> (1) In most cases it is preferable to use port equipment for the handling of bulk cargoes. Speaking generally, port equipment is, from the point of view of efficiency, preferable to ship equipment. It appears to us essential, however, that all ships should be supplied with equipment adequate for their normal trade.
>
> (2) The problem of the mechanical equipment of ports for the handling of freight is too complex to be dealt with in general terms.
>
> In all cases where mechanical equipment can be economically installed, it is desirable that this should be done, as it permits of a quicker and cheaper handling of cargo.
>
> The details of such mechanical equipment must necessarily depend upon the needs and possibilities of each individual port.

Of all the mechanical equipments at a port, none is of greater moment than that provided by the railway connections. Neither London nor Liverpool, the two greatest ports of Great Britain, are well found in that respect. Road access is almost equally essential, and its importance is increased by any lack of good railway facilities. Road facilities have gained an additional importance by the developments of commercial motor vehicles. It is to be deplored that, at many of our older ports, owing to the location of docks and quays in densely populated districts, the road approaches and the facilities for motor vehicles in particular are shockingly insufficient. At London the question is acute, as anyone who cares to go and watch the long queues of vehicles remaining stationary, and periodically moving on a few yards, can see. The loss entailed must be very heavy in the course of a twelvemonth.

It is impossible in the present work to attempt to describe the various methods and appliances used in handling cargo at ports. It would require a substantial volume[1] to do this in the briefest outline. A few general conclusions may not be out of place even though they are not backed by illustration and evidence. The system of elevators and conveyors is decidedly the most efficient when cargo is homogeneous or the packages fairly uniform in size, weight, and shape. In plenty of cases it has been shown to more than double the rate of discharge obtained by quay cranes. On the other hand, when the goods are of a thoroughly miscellaneous character, the most expeditious method is that of employing quay cranes along with ship's booms and derricks to land drafts overside on to trucks, which can convey the goods rapidly away from the quayside. The different kinds of cranes, elevators, conveyors, trucks, etc., which can be used and the selection of the kind most suitable for the particular trade of the particular quay, supply ample scope for wide study and the exercise of judgment.

The use of many of the mechanical appliances, which can be installed on quays, is limited to such cargo as is landed on the quays. A very large proportion of cargo is, however, discharged overside on to lighters or barges. At London the cargo so dealt with amounts to between 80 to 90 per cent of the whole, a high percentage, but one to be found at many ports where the depth of water at the quays is insufficient for the larger ships calling at them. There are several other reasons which may make this the best way of dealing with the cargo. Sometimes it may be resorted to to lighten and so reduce the draught of the ship owing to lack of water at the entrance or in the channel. In other cases the quays or wharves are inadequate, and much cargo must be unloaded at the anchorage. In yet other cases delivery has to be made at a number of different parts of the docks, or at various wharves up-stream. It is, too, a convenient method of transferring cargo between steamers. In some cases it may be noticed that, although barges are resorted to, they are not necessarily the most economical means of dealing with the cargo. At old ports, like London and Hull, the lighterage industry dates back to long before the days of enclosed docks. When the latter were constructed, the lightermen were able to get incorporated into the Acts of Parliament authorising the docks a clause giving the barges free entry into and out of the docks whenever engaged on lighterage work. The mechanical equipment which can be used with barge traffic is practically limited to such equipment as floating derricks for general cargo, and floating grabs or elevators for coal, ore, etc.

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[1] A recent publication of the subject is *Cargo Handling at Ports* by Cunningham.

Important as rapid loading and unloading of cargo is, rapid bunkering may be almost of equal moment in preventing delays and assisting the rapid turn-round of the ship. It is surprising that in this work slow, primitive methods are still quite common. The old system of baskets filled by hand labour will only result in 12 to 15 tons of coal being dealt with by a gang of six men in an hour, whereas the floating elevators used at Southampton can load 200 tons an hour with a crew of eight men, providing trimming can keep pace. A similar kind of elevator appliance used in the Port of London can deal with as much as 300 tons per hour, with a crew of one man more. With such a rate of loading it is obviously difficult for hand trimmers to keep up. Necessity is the mother of invention, and the need for trimming to keep up with the discharge of the coal has resulted in the production of the mechanical trimmer. Not only is the mechanical trimmer a rapid worker, but it is said to do the work on large liners 25 per cent more cheaply than hand trimming.

Bunkering is, however, no longer confined to coal. Not only are a considerable number of ships now using oil fuel, but the proportion is increasing rapidly, as was evidenced by the fact that, at the close of 1923, 36 per cent of the shipping then under construction was to employ oil fuel. The oil bunkering ports are steadily increasing in number, and now include the majority of the most important ports of the British Empire, though there are still some notable exceptions. Perhaps the most striking is the absence of any oil-bunkering port in New Zealand, though as Adelaide, Fremantle, Melbourne, and Sydney are all in the list, most ships will have an opportunity of bunkering without going out of their way.

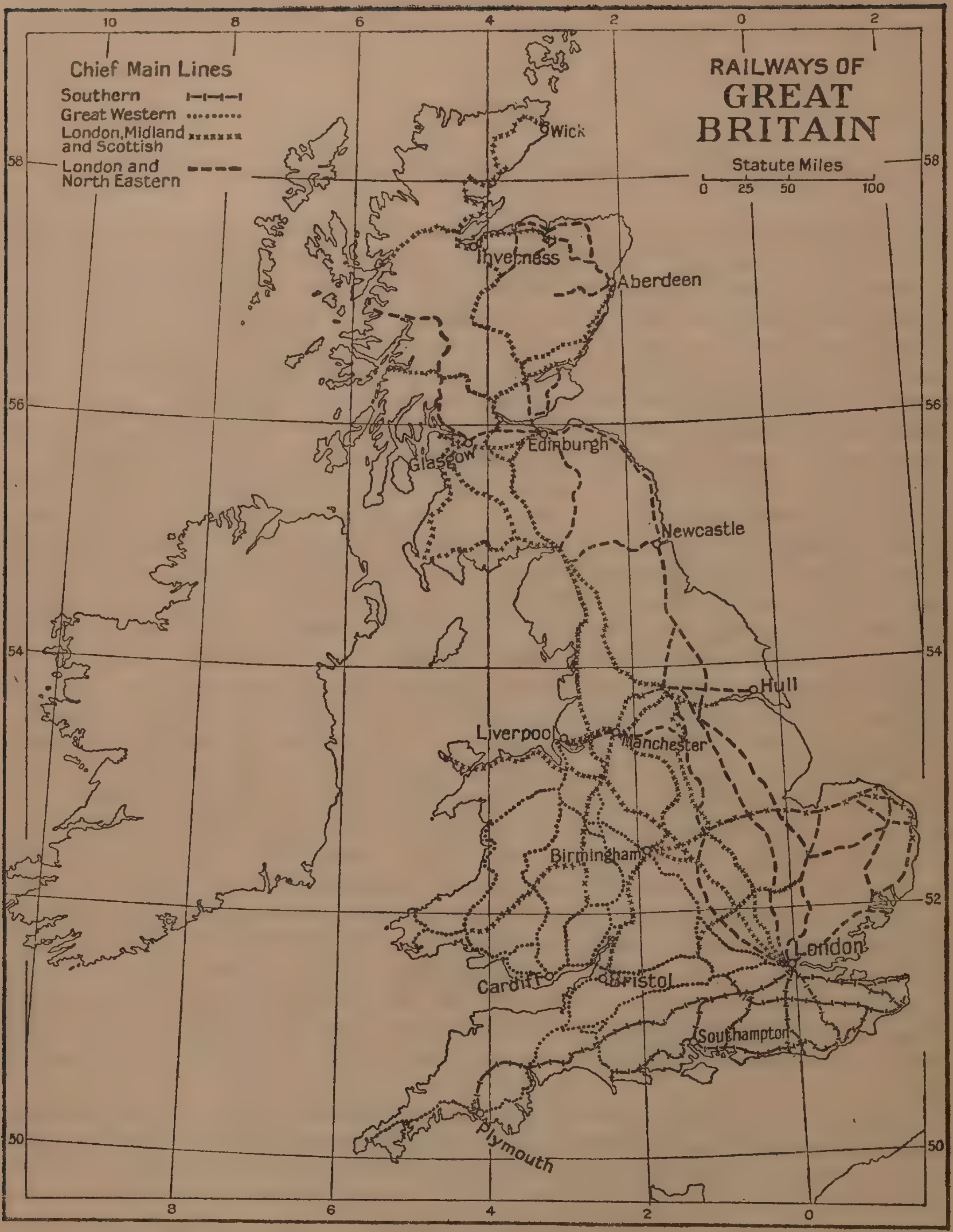
CHAPTER VII

RAILWAYS OF THE EMPIRE—UNITED KINGDOM

WHILST ships are the great means of transport between the United Kingdom and the overseas parts of the Empire, their cargoes have first to be collected over large land areas and brought to the port for shipment, and after discharge at destination have to be distributed over similar land areas. Only a modest part of the cargo arises at the originating port and is consumed or utilised at the destination port. The larger part of this work of collection and distribution is carried out by the railways supplemented by road vehicles. Inland water transport in some cases also plays a not inconsiderable part, but it is generally slower and is much more limited than railways in its range of action.

To a very large extent the railway systems of the Mother Country and the Overseas Dominions and Colonies are wholly independent one of another. In this respect they differ very considerably from shipping. Much as it might be in the interests of the producers of railway material to have certain common standards adopted within the Empire, it is almost inevitable that the railway undertakings will be more influenced by their immediate neighbours than by the railways of countries thousands of miles away. Canadian railways have physical junctions and a substantial amount of through working with the railways of the United States. It is obvious that they will find it most advantageous to adopt standards which approximate to those of the latter country. This undoubtedly gives an advantage to American manufacturers in the supply of material and equipment which Canada may not be able to produce at the time for herself. Where, however, as in Australia and New Zealand, the railways do not come into physical contact with railways outside the Empire, or, where the railways of the Dominion are predominating, as in South Africa, it would be advantageous if technical representatives of the railways could get together and agree on standard dimensions and weights which might be called Imperial Railway Standards, just as the railway engineers of Great Britain have agreed on various British standards. Owing to the chair method of track construction having been adopted in the United Kingdom, the British and the suggested Imperial Standards could not be made identical in respect of the permanent way.

There are differences between the railway systems which are unnecessary, regrettable, and it is to be feared practically incurable, but which ought never to have existed. Variations in railway gauge are responsible for many of these. It is not suggested for one moment that one gauge should have been adopted for the whole Empire. The difference between the cost of a mile of line and its equipment of 3 ft. 6 in. gauge and of 4 ft. 8½ in. gauge is so considerable that many of our Dominions and Colonies would have found a greater difficulty


RAILWAYS OF GREAT BRITAIN
Statute Miles
0 25 50 100
Chief Main Lines
Southern
Great Western
London, Midland and Scottish
London and North Eastern
Wick
Inverness
Aberdeen
Edinburgh
Glasgow
Newcastle
Hull
Liverpool
Manchester
Birmingham
London
Cardiff
Bristol
Southampton
Plymouth
58
56
54
52
50
10
8
6
4
2
0

than they have done in developing their railway system had they been compelled to adopt the latter. India, though, has spent a lot of additional capital on constructing 18,211 miles[1] of railway on a 5 ft. 6 in. gauge, and has not gained a single advantage that she would not have enjoyed had the 4 ft. 8½ in. gauge been selected. Canada and the United States, with the standard gauge, use as wide vehicles, and run as large and as fast trains as any that India has. India further selected the metre standard for her narrow-gauge railways, and has built 15,375 miles[1] of such railway. The saving effected by the 2½ inches that this is less than the 3 ft. 6 in. gauge of the South African railways must have been very small. Yet it means that axles, frames, and various other parts of railway vehicles must differ. The manufacturer wishing to tender for the supply of railway material in both areas may find that the extra time necessary because of the differences effectually prevent him from doing so. In any case, tenders will have to be higher to the extent of the cost of the extra patterns, moulds, etc., which are rendered necessary.

In addition to physical differences, the matter of the railway invoice is worthy of attention. In the United Kingdom distances are so short, that the fact that the railways have issued no document on receiving the goods, which will be accepted by bankers as a document on the security of which advances may be made is immaterial. In many of our Dominions, where distances are great, and the journey-times consequently much longer, the producer or merchant does not find it convenient to wait for his money until the traffic reaches its destination or a ship's bill of lading is issued for it. So the railway issues a bill of lading. The conditions embodied in the bill of lading will be similar to those on the consignment note, and will differ according to the country in which the railways are, though uniform for the whole of the railways of a country. As trade between the Dominions develops it will be a material advantage to have a uniform railway bill of lading, so that the trader in Canada knows that the liability of the railways of Australia is the same as that to which he is accustomed. The railways of the different countries of Europe have enjoyed the advantages of this ever since the Berne Convention was signed in October, 1890. This uniformity might be limited to export and import traffic on a through bill of lading in the first place, but it is not at all unlikely that in time it would result in modifications in the laws, which would make the conditions generally applicable, as has happened in several of the Continental countries.

Although it is clear that there are matters in which there are advantages to be gained from co-ordination and co-operation between the railway systems of the different parts of the Empire, it is indubitable that, to a very large extent, the distances that separate them permit each part of the Empire to develop its railway system with regard to its individual conditions only without detriment to the Empire. So the railways of the United Kingdom and the Dominions overseas will be dealt with separately.

The railways of the United Kingdom are under several disabilities, which are traceable to the fact that they were pioneers. The most striking of these is the loading gauge. When our early railways were built no one realised that the vehicles could be built with a large overhang. So to-day with a line gauge of 4 ft. 8½ in. on most of our railways the limit width is 9 ft., and of height 13 ft. 6 in. at the centre above rail level, though there is a considerable mileage of line which is more restricted by a few inches. This may be contrasted with the 10 ft. width and 16 ft. 6 in. height, which are the maximum limits of the 3 ft. 6 in. railways. Full advantage is taken of the width on the Rhodesian railways, for instance. Or North America may be looked at where the standard gauge railways have rolling stock 11 ft. wide and 15 ft. 6 in. in height above rail level. The loading gauge seriously limits the power of the largest locomotives which can be used, and the size and carrying capacity of vehicles. Trains and train-loads will always be restricted, and expenses of conducting the transport higher on this account. Another factor permanently helping to keep up railway costs, and so rates, is the excessive expenditure of capital due to the prices which the railways had to pay for land. Whilst yet another was the haphazard way in which the early railways were planned and authorised without regard to any national plan. Such mistakes have to be paid for, and may be considered as permanently reflected, some in the high capital costs of our railways and some in the level of working expenses.

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[1] Mileage at 31st March, 1922.

The railways of Great Britain at the beginning of 1923 consisted of 20,298 route miles, with a track mileage of 36,787 ; and in addition there were sidings of a total length of 15,922 miles. This gives one track mile per 2·4 square miles of country, and per 1,160 persons of the population. Ireland at the same date had 3,126[1] route miles of railway with a track mileage of 3,832, or one track mile per 8·5 square miles and per 1,170 persons of the population. The railways of Great Britain, with the exception of the London local railways, were amalgamated last year into four groups, with a route mileage of 19,911 miles, and a running-track mileage of 36,141 miles. The capital expenditure of these four companies amounted to £1,174,480,000. Of this, £133,897,000 had been expended on harbours and docks, shipping, hotels and other property, leaving £1,040,583,000 as the cost of the railways proper. The costs per route mile and per mile of running track work out at the high figures of £52,300 and £28,800, respectively. High as these figures are, they are materially less than the inaccurate figures which were given before the capital was divided in this way. The grouping of the railways under the Railways Act, 1921, was based entirely on the previous companies, no attempt being made to plan new systems following as far as possible the lines which would have been followed if a national scheme had been prepared with little regard to previous ownership. The consequence is that, whilst competition has disappeared at many places which will help the railways to effect economies, it still exists at most of the greatest industrial centres of the kingdom. Moreover, the competition at the places where it remains is keener than it has been at any time during the past thirty years. So long as this continues, it will involve the railways in much wasteful expenditure. A limited number of traders may be gainers, but ultimately this expenditure is met by the rates and charges paid by the whole body of the railways' customers. It is the personal opinion of the writer that this is incompatible with the provision in connection with the standard revenue which requires " economical and efficient management."

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[1] Included are 480 miles of railways of less than standard gauge.

The railway group with the most monopolistic area is the Southern Railway. The south-eastern counties are served by it alone, except for some suburban traffic in the immediate neighbourhood of London. Its contact in the south-west with the Great Western Railway is at the most important places—Plymouth, Exeter ; by a cross-country line it reaches out to Reading, whilst the Great Western gains access to Southampton via Winchester, and to Weymouth. The Great Western Railway lies between the Southern on the one side, and the London, Midland and Scottish on the other. With the latter its competition is keen, as the Great Western lines are found at Birmingham, Wolverhampton, Birkenhead (for Liverpool), whilst the London, Midland and Scottish is at home at Bristol, Bath, Gloucester, in the heart of the Great Western territory, and has access to the coalfields of South Wales. The London, Midland and Scottish Railway, the greatest of the four railways, is in contact with its neighbour on the east, the London and North-Eastern Railway, at many great industrial centres. Both serve Rugby, Leicester, Northampton, Sheffield, Bradford, Leeds. And whilst the former stretches out to Cambridge, Peterborough, Norwich, Yarmouth, and the Humber ports, the latter goes westwards to Manchester and Liverpool and further north to Carlisle. In Scotland, Glasgow, Edinburgh, Perth, Dundee, Aberdeen, in fact almost all the important places are served by both Companies. The Great Western Railway is the greatest dock owner, as it owns most of the South Wales docks, besides serving the port of Bristol.

All the systems, except the Southern, carry vast quantities of coal, coke, and patent fuel. The Great Western is divided between a large agricultural area and a heavy industrial area. The London, Midland and Scottish serves industrial areas almost throughout its length. The metal industries of the Birmingham district, the steel industries of Sheffield, the woollen trade of West Yorkshire, the cotton industries of South Lancashire, and the shipbuilding on the Mersey and the Clyde. The London and North-Eastern Railway serves an area more like that of the Great Western. East Anglia is mainly agricultural, whilst on its western border and in the North of England industry predominates. The only system to rely mainly on passenger traffic is the Southern Railway.

There is no reason to anticipate radical changes materially affecting the railways' customers in the near future. The amalgamations will give the industry all the advantages that are usually associated with large scale production. In time very considerable economies should result, though some of the estimates that have been made considerably overstate these possibilities. Some previously competitive services can be modified. The costs of working of traffic which previously involved transport over two or more companies' lines can be reduced. Engine workings can be rearranged to give greater economy. The reduction in the number of owners of railway wagons will save much expense. These are types of economy only requiring administrative action. Many economies can only be realised after the expenditure of capital. Undoubtedly this is the case with the great locomotive, carriage, and wagon shops, which should be specialised to a degree impossible before. The use of the Westinghouse brake by one and the vacuum brake by another of the railways forming the East Coast route to Scotland caused a lot of wasteful expenditure, which can only end after more expenditure has been incurred, though ultimately economy will result. Rearrangement of marshalling yards and probably the construction of some entirely new ones will be necessary before the train workings can be arranged to the best advantage. In some cases the amalgamation will make it easier to introduce more economical equipment like large wagons. For the economy of these for the coal traffic the Great Western Railway has recently vouched by offering a 5 per cent reduction in the rates for all coal sent in fully loaded 20-ton wagons. But these wagons take time to build and involve expenditure. The railway companies are in a financial position which will permit them to undertake much of this expenditure without fresh issues of capital. A great deal of repair and renewal work could not be carried out during the War, and the railways were able, in consequence, to make large additions to their depreciation and reserve funds. These now stand in the neighbourhood of £120,000,000. Part of this sum may be considered a dividend equalisation fund, but at least 80 per cent may be said to be available for renewals and improvements. The companies' finances are thus in a strong position for carrying out the works which will enable them to effect the economies of which the amalgamations permit.

It is useless, too, to think that the staffs can be completely and effectively amalgamated in a month or a year. Keen "Brighton" railwaymen will not all be converted into "Southern" railwaymen and forget their old competition with the South-Eastern and Chatham Railway in a month or a year. The canvasser does not immediately realise his identification with his group, and may still be found begging for traffic for his old line, whilst his colleague but former competitor pleads as though his line were still a separate entity. This is no new experience with amalgamations, and will take time to break down. The sooner old landmarks, like those maintained by the time-tables and by sectional organisation on the old company lines, can be obliterated, the sooner will the staffs become really and effectively one.

There are, however, three outstanding features in the rearrangement of the railways of Great Britain which are of special interest to the customers. They are (*a*) the arrangements in regard to railway labour; (*b*) the settlement of fares, rates, and other charges by the Rates Tribunal; (*c*) the standard revenue for the railways. Railway labour (wages and salaries) absorbed about £100,000,000, or some 45 per cent of the total receipts from railway working in 1922. The total profits distributed, which can be said to be part of the revenue standardised, amounted to £52,000,000, yielding an average of 4·62 per cent on the receipts from capital, and representing almost 22 per cent of the gross receipts of the railway companies. In pre-War days this percentage was about 35 or 36, but, whereas the value of the physical railway capital has immensely appreciated, the railway shareholders have not been allowed any consideration on that account. As expenses fall, the percentage will rise nearer to 30. These two items—the remuneration of labour, and the remuneration of capital—account for the major part of the gross receipts.

As regards labour, the National Wages Board was reconstituted by Section 64 of the Railways Act, 1921. This Board is representative of the three railway interests—the Railway Companies (6), the Railwaymen (6), the users of the Railway (4)—with an independent chairman nominated by the Minister of Labour. The representatives of the railwaymen are appointed two each by each of the three railway unions—the National Union of Railwaymen, the Associated Society of Locomotive Engineers and Firemen, and the Railway Clerks' Association. The representatives of the railway users are nominated one each by the Parliamentary Committee of the Trades Union Congress, the Co-operative Union, the Association of British Chambers of Commerce, and the Federation of British Industries. This is the final court of appeal. It is the last stage in a series of Councils formed on the individual railways, and followed by a Central Wages Board, which endeavour to settle questions relating to rates of pay, hours of duty, or other conditions of service of employees without the assistance of an independent chairman or the users of the railways. Although the Wages Board may give an absolutely unanimous decision, none of the parties involved are compelled to accept the decision.

This machinery has just been through a severe test. The Railway Companies accepted a series of decisions of the Board which rejected some 85 per cent of what they sought. For the most part it was almost a 100 per cent rejection, but certain claims in respect of locomotive men were largely granted. The National Union and the Clerks' Association both accepted the decision, but the Associated Society notified that their members would go on strike rather than accept the decision. This they did, in spite of strenuous efforts on the part of the other Unions and the Trade Union Congress to find a solution acceptable to all parties. It cannot be said that the members of the Associated Society were committing any breach of an agreement in so acting. This action, however, throws into the limelight the difference between organisation by the industry, and organisation by craft.

It is of vital importance to the trade and industry of the country that this machinery should be thoroughly effective. In such a key industry as the railways, a strike can inflict such incalculable harm on the country, and cause such suffering and inconvenience to the individual, that the national welfare demands that everything possible should be done to prevent such an occurrence. A valuable hint for an additional safeguard against a strike may be got from Canada, where under the Trades Disputes Act an interval must elapse between the publication of the report of the enquiry and a strike. Further, it is a penal offence in any way to urge or promote a strike until the enquiry is completed and the report issued. Time is often a very vital element in the avoidance of a strike. If the wages machinery should prove really effective then it is not too much to say that the control of far the biggest item in the railway expenses is taken out of the hands of the railway management, since it is ultimately settled by a body in which the railway companies' representatives are in a minority.

The whole matter of railway expenditure on labour is of great importance to the railway customers, as it is useless to expect large reductions in rates and fares unless this expenditure can be reduced. The very high level to which this has grown is partly the result of action believed to have been taken by the Government against the advice of the railway managers. Particularly is this the case in regard to the general adoption of the 8-hour day. At many country stations and level-crossings it is not possible to find work for the staff for more than half their time if there is to be continuous duty with only one interval. Whatever theoretical ideas may be held on the subject of the 8-hour day, it is a practical impossibility in the positions to which reference is made for a man to do sufficient work in the 8-hour shift to fairly earn from the community a day's wage sufficient to support a wife and family. On the Continent, where the State usually has a large financial interest in the railways, the 8-hour day, which was granted in much the same way as here, has been modified to a considerable extent as the result of Government action. In Switzerland it has been frankly abandoned for a 9-hour day. In France it has been superseded by a 2,504-hours year (equal 313 days of 8 hours each), and arrangements have been made for staff to work an additional 450 hours a year if traffic arrangements require it—certain exceptions being made. In Germany, the matter has been dealt with by making a distinction between hours of work and hours of duty when not working. The latter are translated into a shorter number of hours of work by means of a series of equivalents, which may make the non-working hour count as little as 20-minutes' work, but 30 minutes is the most usual. The total hours of duty will then be such as will translate into 8 hours' work. So little actual work is done by many of the staff that it has been found necessary to insert limits to the total hours of duty, otherwise very excessive hours would have resulted. In our own country and in the United States of America, in neither of which has the State a direct financial stake in the railways, the modifications necessary to bring the wholesale concessions in hours and wages made during the period of Government control into reasonable working order are being left to be haggled over by the railway companies and the men. The process is slow, and meantime rates have to be kept at a level which trade can ill bear.

The railways' customer, however, concerns himself chiefly with the sums that he has to pay to the railway for the carriage of himself or his goods. The control of the basic rates on which these are to be calculated is revolutionised by the Railways Act. A new body, the Railway Rates Tribunal—consisting of three permanent members with power to add two persons to their number, whenever it is deemed expedient—has been set up with almost complete power to settle fares, rates, and other charges for passenger and freight traffic. The classification of merchandise, which also comes within its jurisdiction, has been settled by the Railway Rates Advisory Committee, which was already engaged on the task before the Railways Act was passed. At the present time the Rates Tribunal is engaged on the task of settling the schedule of charges for each of the four great railway companies. When these are fixed, they will be known as " the standard charges," and " no variation either upwards or downwards shall be made from such authorised charges, unless by way of an exceptional rate or an exceptional fare continued, granted, or fixed under the provisions of this part of this Act or in respect of competitive traffic in accordance therewith."[1] The railway companies still have the power to continue and grant exceptional rates, but they must not be " less than 5 per cent nor more than 40 per cent below the standard rate chargeable " without the consent of the Rates Tribunal. The power is not absolute even within the limits, since the Minister of Transport may on certain grounds refer new exceptional rates to the Rates Tribunal. Further, " any trader may, at any time, apply to the Rates Tribunal to fix a new exceptional rate or to cancel or vary an existing one." Once an exceptional rate has been fixed by the Tribunal, the railway company is debarred from increasing or cancelling it without the Tribunal's sanction. It is thus in the power of the traders to bring the whole body of exceptional rates within the control of the Rates Tribunal if they so desire. It is probable, however, that they will prefer to agree with the railways direct in the majority of cases in order to avoid the loss of time inseparable from an appeal to the Tribunal. In any case, the Tribunal is to review the exceptional charges along with the standard charges at the end of the first complete year from the appointed day, and at intervals subsequently.

Some idea of the importance of the provisions in regard to exceptional rates may be gained from the commonly accepted statement that not less than 75 per cent of the traffic carried by the railways paid such rates. By absorption of many of these rates into the new scales, it is anticipated that a substantial proportion of them will cease to be " exceptional," though in fact continued with no more change than may be caused by the 5 per cent limitation.

The Tribunal is subject to certain directions and limitations in fixing charges. The public interest is to be an important factor, as they are expressly enjoined to " have regard to the means which in their opinion are best calculated to ensure the maximum development and extension in the public interest of the carriage by railway of merchandise and of passengers and their luggage." This, however, is to be within the limits imposed by the over-riding consideration of the railway companies' net revenue. Clause 58 (1) of the Act provides for this and reads as follows :—

> The charges to be fixed in the first instance for each amalgamated company shall be such as will, together with the other sources of revenue, in the opinion of the rates tribunal, so far as practicable yield, with efficient and economical working and management, an annual net revenue (hereinafter referred to as the standard revenue) equivalent to the aggregate net revenues in the year nineteen hundred and thirteen of the constituent companies and the subsidiary companies absorbed by the amalgamated company, together with—
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> (*a*) a sum equal to five per cent on capital expenditure forming the basis on which interest was allowed at the end of the period during which the constituent companies and subsidiary companies were [illegible] the possession of the Government ; and
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> (*b*) such allowance as may be necessary to remunerate adequately any additional

[1] Railways Act, 1921. Part III, Sec. 32.

capital which may have been raised or provided in respect of expenditure on capital account incurred since the first day of January, nineteen hundred and thirteen, and not included in the expenditure, referred to in the last preceding paragraph, unless it can be shown that such expenditure has not enhanced the value of the undertaking ; and

(*c*) such allowance as appears to the rates tribunal to be reasonable in respect of capital expenditure (not being less than twenty-five thousand pounds) in the case of any work, and not being capital expenditure included in paragraph (*a*), on works which enhance the value of the undertaking, but which had not at the beginning of the year nineteen hundred and thirteen become fully remunerative :

Provided that, in determining the sum which charges will, with efficient and economic working and management, yield, the tribunal shall, with a view to encouraging the taking of early steps for effecting economies in working and management expenses rendered possible by or in anticipation of amalgamation, take into consideration the economies effected by such steps already taken, and shall make such allowance in respect thereof as the tribunal may consider fair and equitable to an amount not exceeding thirty-three and one-third per cent of such economies.

In this there are two matters which stand out as of special interest. The one is the fixing of the railway net revenue ; the other is that the right to claim the net revenue unimpaired is conditional on " efficient and economical working and management." It is interesting to note the variation of this phrase in the last paragraph. It is improbable that any difference was intended by the legislature, but there may be some difference of opinion as to " economic " management meaning identically the same thing as " economical " management.

Hitherto the railways have had a net income which has varied with good times and bad. The variation has, on the whole, been less than in most industries, but this has been partly due to skilful manipulation of the expenditure. In bad times works are postponed as far as is considered wise and may be necessary, whilst in good times arrears are made up, and generous provision for depreciation made in advance of the inevitable slump which will come sooner or later. The last thing that traders will want will be that rates should be continually on the move up and down as the result of the annual survey by the Rates Tribunal. Not only would the continual changes be disturbing to trade, but the slump in trade, by curtailing traffic, would reduce the railway net revenue and be a pointer to a rise in rates just when trade could least afford it. To give stability to rates and other charges it will be essential that the Rates Tribunal adopt the line that economic management requires not merely provision for depreciation and a dividend equalization fund, but that such provision must be variable according to the results of the year. Hard and fast percentages, such as are commonly adopted in government departments, are quite unsuitable here. Moreover, it is the only really practical way of carrying out the provisions relating to the standard revenue, though it adds to the difficulty of making the condition of efficiency and economy effective.

There are those who doubt whether, under any circumstances, the standard net revenue is attainable. It is certain that the motor vehicle on the road has deprived the railways of some traffic, but it is hardly conceivable that the general public will agree to continue to subsidise the road traffic through the road indefinitely and to such an extent as to bring the railway industry permanently to a financial condition in which the State would have to come to its assistance. Apart from this, the writer ventures to predict that the economies which will gradually be realised from the amalgamations, combined with a reasonable adjustment of the labour conditions, will, if the railway companies pull together, be sufficient to make the standard revenue perfectly attainable.

The difficulty of applying justly the condition that there must be efficient and economical (or economic) working and management would seem to be very great. Yet it is a very vital condition, and an important safeguard to the traders of the country. In matters of small detail it is clear that neither the Tribunal, nor the Ministry of Transport, nor the railways' customers can make an effective case which would justify a refusal to adjust rates outside the standard revenue rule. This, however, need not be the case in many large matters. If the operating ratio for one railway company rose whilst for the other three companies it had fallen, in the absence of special circumstances there would be presumptive evidence of a lack of efficiency and economy. The essential condition which must be fulfilled, if criticism of efficiency and economy is to be anything more than an expression of pious opinion, is that there should be made public adequate statistics of the railway operations, and particulars sufficiently subdivided of how their revenue is earned and spent.

Of these there are two sources of information. The annual accounts of the railway companies, summarised later in the Railway Returns,[1] an annual Blue Book issuing from the Ministry of Transport, and the monthly railway statistics issued by the same body. The latter contain no information of the railway expenditure, so at present the traders and the public generally have no information as to how far changes in revenue are being balanced by changes in expenditure. Only once a year, when the annual reports are issued, is any trustworthy information vouchsafed. It would be a great advantage if, when the railways issued their statements of estimated receipts to the Press, they would also issue an estimate of expenses. The receipts statements are issued weekly, and it is not improbable that weekly statements of expenses might prove misleading. Still it is quite certain that the directors and managers of the railways are not content to wait for twelve months with no information as to the trend of expenditure. The traders may well claim that they should have monthly or at least quarterly estimates. Without these they can make no preparations for the annual review of charges by the Rates Tribunal until February is well advanced, and any necessary changes cannot be given effect until a date far removed from the period covered by the railway accounts. The delays in giving effect to changes are injurious to trade when the charges should be reduced, and injurious to the railways when the charges should be increased. This lag is always the greatest complaint levied at State control of railway rates.

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[1] The price of this has been raised to the high price of 21s., which places it out of the reach of many persons who ought to examine it.

Then it is important not only that the accounts and statistics issued should be comprehensive, but they must be reasonably accurate and unimpeachable. During the War, when under the Government guarantee all deficiencies had to be made good by the Treasury, even to provision for deferred maintenance, the accounts of each railway were audited on behalf of the Government by leading accountants on the staffs of other railways. It is well known that the audit resulted in important modifications of the sums due from the Treasury in some cases. The dividing line between what ought to be capital expenditure and what should be charged to revenue is never very clearly defined. A bias always on the side of charging to revenue could make a substantial difference in the gross revenue needed to provide the standard net revenue. The question may well be asked whether the traders of the country can be certain of equitable treatment in this respect, unless provision is made for a systematic inspection of the accounts. No suggestion of any deliberate intention on the part of the railway companies to be unfair to the public is intended for one moment. But in matters where there is room for a considerable divergence of opinion, it is only human nature that the railway management should incline to allow a large margin of safety on the railway side.

Figures, too, must be unimpeachable. To rely on certain statistics, and then, when use is made of them, to be told they are such rough estimates that they are an untrustworthy guide would be intolerable. One of the most important tests of efficiency in railway operation is the train-load. It is incontestable that the big increase in the average train-load in this country which took place between 1902 and 1914 resulted in large economies. It is recognised that the low rates charged on the railways of the United States are largely attributable to the large train-loads worked, the average load being 750 tons or rather more than five times the freight train-load in this country. When the Ministry of Transport first issued the monthly statistics, the ton-miles, from which the average train-load was derived, were attempted to be actually calculated. For some time now, with the object of reducing work, this direct calculation has ceased, and the following method of estimating the figures substituted :—

> The net ton-miles have been ascertained by multiplying the loaded wagon miles for (*a*) general merchandise and live stock, (*b*) coal, coke, and patent fuel, and (*c*) other minerals, by the respective average wagon loads of the three classes of traffic. For this purpose the average wagon loads have been obtained by dividing the total forwarded and received tonnage by the total number of loaded wagons forwarded and received. In the case of the large companies, their systems have been divided into areas, and the average wagon loads in each area have been applied to the relative loaded wagon miles.

This method of ascertainment is certainly not yielding the correct ton-mile, and so the train-load figure is inaccurate. For a short period it is probable that the extent of the inaccuracy is a small and almost constant percentage. Taken over a long period, five or ten years, no such assumption can be made. At some critical time the trustworthiness of the figure may be challenged, and its unreliability may mean the breakdown of a good case. Statistics, which are known to be calculated on a wrong basis, are apt to prove broken reeds.

Although the Rates Tribunal has no jurisdiction over the charges made in respect of many of the businesses carried on by a railway company, ancillary or subsidiary to its railways, it has to take them into account when making the railway charges. Section 58 (4) of the Railways Act provides that " if in the opinion of the Tribunal the company is not making, or has not taken reasonable steps to enable it to make adequate charges in respect of any such business, the Tribunal shall, in fixing the charges under this Part (III) of this Act, take into account the revenue which would be produced by any such business if adequate charges were in operation." This clause was inserted because many traders believed that not merely were subsidiary businesses being run at the expense of the railway traffic, but that in some cases this was being done in order to conduct an unfair competition with other persons engaged in the same business. Whilst there may have been some slight foundation for this, it will, in the opinion of the writer, be disastrous if each business is made to stand entirely on its own regardless of the benefits it confers on the main railway business. Every trader knows that he conducts some business not for the direct gain from it, but for the indirect benefits which accrue from the other business thereby brought to him. So a railway company may run an hotel, a line of steamers, or purchase a dock, not for the direct profit on the venture, but for the sake of the profit to be earned on the railway from the additional traffic resulting from the existence of a good modern hotel, a regular line of steamers, or a well-equipped dock. It is quite clear that the Rates Tribunal are allowed discretion in this matter.

What the Rates Tribunal will do in many of these matters is unknown, but meanwhile certain changes in rate-making were either settled by the Act or have been settled since. The classification of merchandise is one of the latter. This document was issued last year. Certain noteworthy changes have been made. With the avowed object of materially reducing the numbers of exceptional rates, the general classification for merchandise by goods train has been divided into 21 classes instead of 8 as now. The increase in the number of classes is particularly great at the lower end of the scale, the three alphabetical classes A, B, and C, and classes I and II having been subdivided into 16 classes. Further, whereas the charges for the conveyance of merchandise by passenger train were formerly only controlled in the case of certain perishable traffic, the whole of the traffic now comes under control, and a classification over and above that for the perishables, which is revised, dividing the traffic into thirteen classes has been added.[1] Many changes have been made in the conditions of carriage, and the packing rules have been consolidated and revised.

A striking change provided for in the Act is the abolition of the old " C and D " rate, the most comprehensive railway rate in the world. In future the standard rates will include neither collection nor delivery by road of the goods, but separate extra charges, to be published in the station rate book, will be made. This will get rid of a great deal of discontent which has existed over the amounts of the rebates granted when the cartage work has been performed by the consignor or consignee. The change will involve the railway companies in some additional work in collecting the cartage charges, but in return they have been given a valuable protective clause. Whilst, if they undertake the cartage work, the companies must do it for all alike, they need not do the work for any person unless he undertakes to let them do it for the whole of his traffic or the whole of his perishable traffic. The railways are thus protected from the not uncommon practice of the trader using the railway's cartage facilities as a reserve to be used only when his own carts prove inadequate. In some cases merchants may find it necessary to revise the wording of their contracts as the term " carriage paid " may become synonymous with " carriage paid to nearest railway station."

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[1] This, to a considerable extent, represents a revision of the voluntary classifications which the railway companies had gradually built up.

Another very great change to be brought about by the Act is in the owner's risk rates. Hitherto class rates have often been modified to meet traffic requirements by quoting a percentage reduction, and then attaching the owner's risk conditions. Between the amount of the reduction and the liability of which the railway company was relieved there was absolutely no connection whatsoever. The risk involved in the carriage of common wood doors and window shutters is only a fraction of the 15 per cent reduction which is allowed if an owner's risk consignment note is signed. When the new rates are made " the difference between an ordinary rate and an owner's risk rate shall be such as in the opinion of the Rates Tribunal is fairly equivalent to the amount by which the risk of the company in the case of the merchandise in question differs under the two sets of conditions."[1] This change may mean a much smaller use being made of owner's risk rates than in the past, as the companies can be required to quote exceptional rates as well as ordinary rates under both conditions and according to this rule for all damageable goods.

A noticeable gap in the provisions of the Act is the absence of any co-ordination between the National Wages Board and the Rates Tribunal. The latter must make its decisions on assumptions that wages either will or will not be altered. Even if they guess correctly that wages will be raised or lowered, there is a further chance of error in over- or under-estimating the change. Exactly the same lack of co-ordination exists in the United States of America between the Wages Board and the Interstate Commerce Commission. Already, since the release of the railroads from Government control, the latter body has made mistakes in fixing rates through acting on an assumption that the Wages Board would reduce rates of wages, and the Board have ultimately decided on no changes. The Board and the Tribunal are constituted on such different lines that it will be difficult to establish a satisfactory liaison between them. The present arrangement though makes it imperative that both bodies should act with a minimum of delay. Economies resulting from reduced wages should be reflected as quickly as possible in the rates, otherwise a substantial excess over the standard revenue will result, and the railways are entitled to have 20 per cent of this excess as a permanent addition to the standard revenue.

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[1] Railways Act, 1921. Sec. 46 (3).

Apart from the changes noticed no revolutionary changes in railway services or charges are to be expected. There is no ground for thinking that the comparisons, which are frequently made between the railway rates of this country and those of other countries, will be less unfavourable than they have been. That would require a revolution in the outlook. In no country have the railways subordinated cost of service so much to quality of service as in Great Britain. In countries of great distances cheapness of transport must come first. Frequency and speed of service are continually sacrificed to this paramount necessity. On the Continent of Europe the system of varying the charges for fast and slow transport prevails. The latter, *petite vitesse*, is the normal means of conveyance adopted, and very generous allowances of time are prescribed. If the transport is carried out within such time, no claim can be made for loss or damage due to delay. Very considerable use is made of these times by the railways to assist them to get good wagon-loading, large train-loads, and so work the traffic with a minimum of rolling stock and trains. So valuable are these time allowances found to be that in France an extension of them is nearly always coupled with any concession in the rates. No doubt, traders would like to retain the fast and frequent services and have low rates. The two are impossible at one time. In pre-War days this country was rich and could afford the luxury of an exceptionally high-class service for its goods. It is now much poorer and it is possible that the trade of the country would benefit more from a railway service of a less high standard in speed and frequency combined with lower rates and charges.

TRADE ORGANISATIONS AND THE RAILWAYS

In connection with the passing of the Railways Act, 1921, a word must be said as to the important influence which trade organisation has had upon the position of the railway companies and upon their relations with the traders.

The public enquiries which attended the legislation of 1891 and 1892 indicate the suspicion and hostility which existed at that time between the traders and the railways. It can hardly be doubted that a contributory cause of this feeling was to be found in the lack of organisation and consequent weakness of the former, which became so apparent when the two forces were arrayed against one another at the judicial enquiries of that date.

It can hardly be mere coincidence that the development of such organisations as the Federation of British Industries and the improvement of the relations between the traders and the railways date from the same period, and, indeed, a comparison of the minutes of proceedings of the earlier judicial enquiries with those of the Rates Advisory Committee and the Railway Rates Tribunal which was set up by the Railways Act, 1921, will indicate these phenomena with some clearness. Instead of the traders being represented as previously by counsel appearing in the interests of this or that locality, or by individual witnesses speaking from the knowledge of particular firms but in the name of individual trades, we find the subject matter of the various enquiries embraced by the general revision of railway rates and charges now proceeding is normally thrashed out at round table discussions between the Railway Companies Rates and Charges Committee on the one hand and the Traders' Co-ordinating Committee on the other. In this way the work of the Rates Tribunal is rendered both easier and more rapid, and the subject matter to be dealt with by the Tribunal is defined and divided up into two parts: first (usually the greater part), matter which is agreed, and second, specified points upon which the parties have been unable to reach agreement. On some of the more technical matters the parties before the Tribunal are not even represented by counsel, and this, having regard to the detailed discussions which have preceded the enquiry, generally results in a great saving of time and expense.

It must be apparent, therefore, that not only are the labours of the Tribunal reduced, but that generally speaking difficult and complex questions connected with railway law and practice are dealt with by co-operation rather than by litigation between the parties chiefly interested. This practical intercourse and co-operation in matters of past controversy has already exerted a profound influence on the relations of the trade of the country with its railway carriers, and it is to be hoped that the movement may survive the present enquiries and extend beyond them into other spheres of activity.

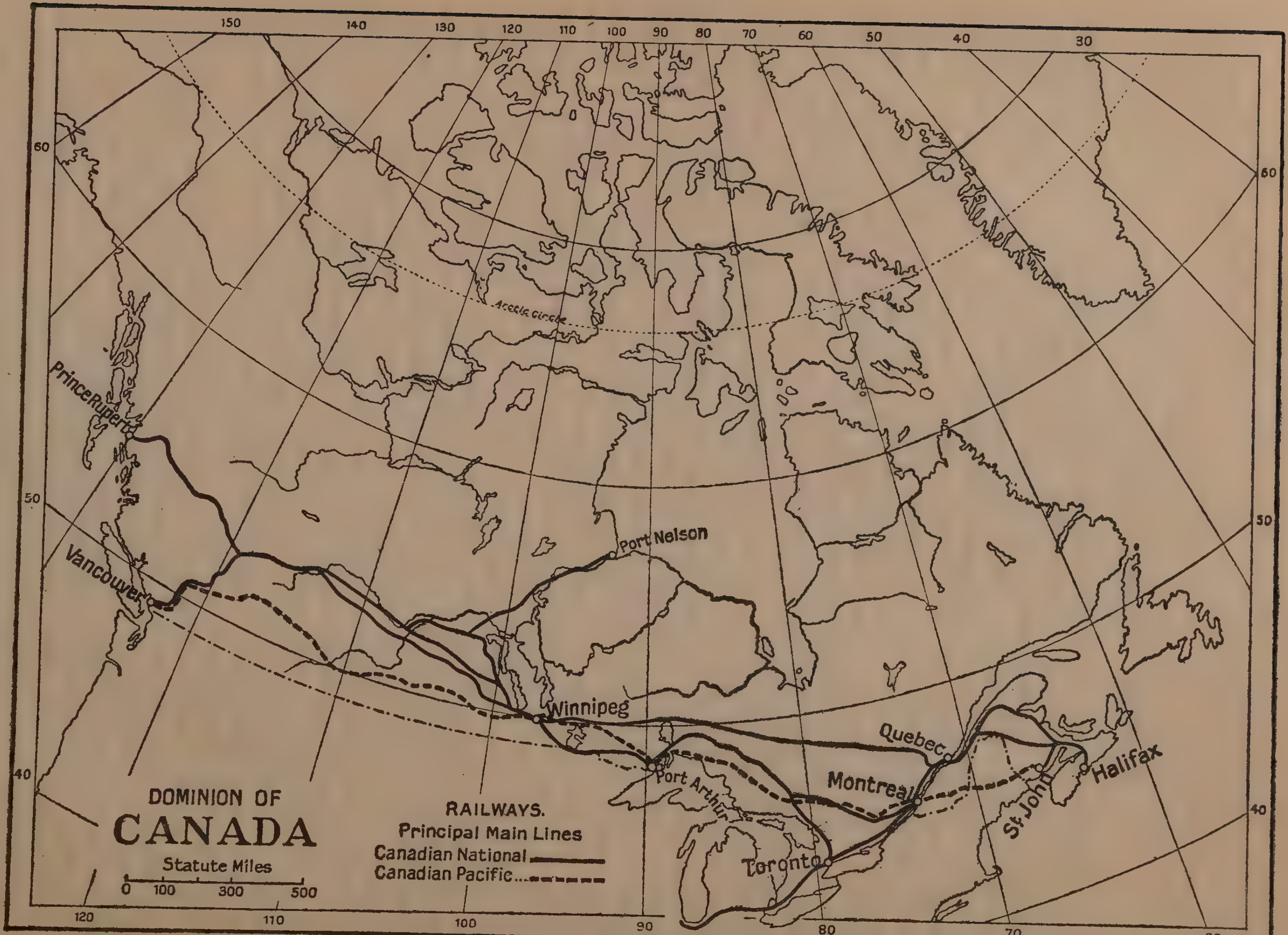
CHAPTER VIII

THE RAILWAYS OF CANADA

If a contrast were needed to the railways of the United Kingdom, Canada might well be selected to supply it. It is not merely that the great differences in area, development, and geographical conditions are inevitably reflected in the railways, but the policy of railway development has not been scientifically planned. It has proceeded too far in advance of the requirements of the country, and has been too much subject to changes of policy consequent upon changes of government. The result was that a stage approaching bankruptcy ensued for most of the railway undertakings after the Great War, and the Government was practically compelled to take over and reorganise as a national system a mileage of railway which, with what it previously had, made the Government the owner and operator of more than half the railways of Canada.

The railway mileage of Canada at the beginning of 1923 amounted to 39,800 route miles. When compared to the population of Canada, estimated at 8,800,000 persons, it shows the remarkable result of one mile of railway to every 220 persons. Great Britain had over 2000 persons per mile of railway. Even if track mileage is substituted for route mileage, the figures are 205 and 1,160 respectively. Actually the route mileage is about double that of Great Britain, whilst the population is about one-fifth. The track mileages differ by little. Canada's neighbour, the United States, has about 400 inhabitants per route mile of railway, and even such a pastoral country as Argentina has 400. Further, Canada has, in the Great Lakes, the St. Lawrence, and the canals connected with them, a system of inland water transport with which Argentina has nothing to compare. On these waterways are carried some millions of tons of freight a year, a very large proportion of the grain from the Western Provinces being transhipped from the railway to the waterways at the head of the Great Lakes. If the mileage be taken in relation to area Canada occupies a place far down the list. But area, unless accompanied by population, means potentialities only so far as railway traffic is concerned. It is evident that in Canada railways were built too far ahead of requirements. This is traceable very largely to the amount of aid given by the Government and the manner in which such aid was given.

It is set out in the annual report on the Railways of Canada (1921) that cash aid had been given the railways by the Dominion of $222,000,000 (say £45,000,000), whilst the provinces and municipalities had given a further $59,000,000 (£12,000,000). These alone represent over £1,400 per route mile of railway. It may be noticed that included in the Dominion cash aid is a sum of $38,000,000 which was spent by the Government on surveys and 800 miles of completed railway. In addition to this there have been land grants totalling 46,600,000 acres, or 1,170 acres per route mile of railway. Of these, 23,000,000



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acres have been sold by the railways to which they were granted, and the proceeds amount to $158,000,000 (say £32,000,000), a further £800 per route mile. In addition, the Government lent or invested large sums in the railways, as well as guaranteeing loans for over £50,000,000.

There are two or three features about the way in which huge assistance has been given to which attention may be drawn and which are not unopen to criticism. The first is the inequality of the assistance given to the different undertakings. Of the cash subsidies no less than $105,000,000 went to the Canadian Pacific. In contrast, the Grand Trunk got $28,000,000, of which half was a loan, " interest on which was never asked for or paid."[1] But whilst this represented the total assistance to the latter, the former has obtained land grants of 28,000,000 acres (excluding those purchased back by the Dominion Government), and from the sale of 16,500,000 acres it had received by 1916 $124,000,000. This has enormously complicated the problems of railway rates in Canada, not merely in the particular case illustrated, but with the other railways, for no two of the principal railway undertakings have been assisted alike.

A distinction must be drawn between the cash investment and the land grants. After all, until the railway was built the land was worth literally nothing, and it was the railway which gave each acre a value.

The way in which the grants were given was of great moment. Land was donated in alternate sections, and each fresh branch built brought an additional lot of acres. The tendency was to plan out fresh branches and additional mileage rather than to concentrate on the development of the territory already served. Meanwhile the alternate sections owned by the Government were being taken up, and, as the free land near the railway was occupied, the railway-owned land steadily increased in value. This was one cause of railway mileage being developed ahead of the real needs of the country.

Then there was the encouragement given to the Canadian Northern and the Grand Trunk Railways to invade each other's territories. The Canadian Pacific, stretching right across the country, had the advantage of gathering its own traffic for itself, and keeping it in its own possession throughout. The other two were in a different position. The Canadian Northern had to depend for Westbound traffic mainly on what the railways in the East handed to it. On the traffic which it collected in its own area it got a relatively short haul, and had no part in the really long haul to the East. The true solution was that the Grand Trunk and Canadian Northern Railways should have amalgamated, and so given the country a second transcontinental railway. Instead the Grand Trunk started building westward, and the Canadian Northern eastward. To both a large measure of help was given by the Dominion, with the result that three transcontinental routes came into being, when the population and stage of development of the country did not warrant more than two.

Owing to the position produced by over-rapid expansion, carried out at times without regard to economy, several of the railways found themselves in a difficult position, and it only required little (much less than such an upheaval as the War caused) to plunge the railways into a hopeless predicament. The result has been that, following on the Report of the Royal Commission on Railways and Transportation in Canada in 1917, there has eventuated a position in which the bulk of the railways of Canada are divided into two systems. The one consists of the Canadian National Railways, which are operating some 22,600 miles of railway—about 2000 of which are in the United States—and the other, the Canadian Pacific Railway, which is operating about 13,900 miles in Canada and 6,100 miles in the United States. In view of the recent organisation of the first-named, its position, both financial and working, is of great interest.

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[1] Canadian Railway Enquiry Commission, 1917, p. xvii.

For the year 1923, the Canadian National Railways had an operating revenue of $254,660,000, whilst the corresponding expenses amounted to $234,530,000. The increase in revenue was $21,000,000, whilst in the expenses the increase was only $3,560,000, resulting in a net revenue of $20,130,000 (an increase of $17,440,000). Judging from the results for the first nine months of the year, nearly one-sixth of the operating revenue is earned in the United States, and fully half the profit. This is a striking piece of evidence as to the comparative sparseness of traffic on a large part of the system in Canada. Evidence of the effects of the consolidation can be gleaned from certain comparisons with the Canadian Pacific. During the first nine months of 1923, the Canadian National improved its net revenue by $6,000,000 compared with the previous year, whilst the Canadian Pacific just held its position. Evidently the Government railways are able to compete more efficiently as a single system, and have also been able to effect economies in working. Further evidence is furnished by the fact that for the whole of the railways of Canada taken together, the increase in net revenue was practically identical with the increase on the National railways.

It is not justifiable to draw from this any conclusion as to the relative advantages of State and Company railways. The Canadian Government found their general manager on a railway in the Mother Country, and his earlier experience had been gained in company railways in the United States. Then a Railway Board has been set up representative of all interests, and it is plainly determined to resist the intrusion of any outside influence into either the management of the railways or the appointments made to the staffs. Further, the Grand Trunk has suffered badly from being controlled by a Board 3000 miles away, living under conditions very different from those of Canada. At the same time it is practically certain that no company could have achieved the same results, as the position financially was so bad that it required the Government purse and nothing less would suffice.

The freight rates charged on the Canadian railways are still very low notwithstanding the increases which have been necessitated by the world rise in wages and prices of materials. The average freight receipt is barely 1 cent per ton per mile. This low figure is accounted for by several causes. The capital cost of the railways only averages some $50,000 (say £10,000) per mile, though the actual cost of the railways has been appreciably more. Then the traffic gets a long haul—the average for all the railways is about 300 miles, but on the Canadian Pacific the average exceeds 360 miles, and for the National railways exceeds 320 miles. By using powerful locomotives, and large wagons, the trains are made to carry an average load of freight of about 600 tons, of which over 500 tons is revenue freight. So low are the rates for grain that considerable complaint has been made in the United States recently by the grain traders that they are placed at a disadvantage. Comparisons made of a number of grain rates for similar distances and with similar quantities and densities of traffic showed that, whereas in Canada 1 cent would pay for the movement of a bushel for 66 miles, the same coin would only pay for 37½ miles in the United States. These low rates cannot, however, be considered reasonable. In 1921, half the railways of Canada failed to cover their operating expenses, and only six out of the fifty-six railways that then existed were able to declare dividends. Evidently the Railway Commisioners, who control the charges, have not permitted them to be placed on a level which would enable the average railway to pay its way and earn a very modest profit. Doubtless the Commissioners have been influenced by the good profits made by the Canadian Pacific. For fear of making this railway too rich, the other chief railways were authorised to make charges which made them too poor for efficiency. The danger now is different. The Canadian National Railways, with the public purse behind them, might be induced to carry on at such low rates that the profits of the Canadian Pacific would be seriously impaired. It is not anticipated that anything of this sort will be allowed to happen, but the risk was recognised in the report of the Royal Commission, and caused them to express the view that "if the State took over and undertook to operate the Grand Trunk, the Grand Trunk Pacific, and the Canadian Northern, it would be morally bound to offer to purchase the Canadian Pacific also."[1]

The passenger fares are also quite moderate, the average receipt per passenger per mile being 2·8 cents, equivalent to about 1½d. The great transcontinental express trains do not compare unfavourably with those of the United States. "The Continental Limited" of the Canadian National Railways may be cited as covering the 2,937 miles from Montreal to Vancouver in 4 days 9 hours 35 minutes, a very fine performance when it is borne in mind that the railway is single line for practically its whole length. On various parts of the railways the tourist traffic is quite considerable, and the railways endeavour to encourage it by providing special accommodation and also by fares that are materially below the ordinary fares. In connection with this it may be mentioned that the Canadian Pacific and the Canadian National Railways between them own twenty-one hotels. Not all of these are primarily hotels for tourists and holiday makers, but a few have been established with no other object in view.

The activities of the two great railways are very wide. The Board of the National Railways also controls the Canadian Government Merchant Marine, Limited, so that the link between the two is of the closest. The Canadian Pacific Railway both works a fleet of lake and coastal vessels, and, through the

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[1] Report of Royal Commission on Railways in Canada, 1917, p. xlv.

Canadian Pacific Ocean Steamships, Ltd., participates in trans-Atlantic and trans-Pacific lines. Both undertakings are ready to arrange through bills of lading from inland places on their systems to most parts of the world. Another important side of their activities is telegraphs. The Canadian Pacific has 125,000 miles of wire, and the Canadian National 102,000 miles. Between them they are responsible for all but a very small part of the internal telegraph system of the Dominion.

The greatest essential for the railways of Canada is the development of new and additional traffic. Great stretches of the railways still run through territory that has been so little developed that the local traffic is negligible. In other parts not more than half the land within a few miles of the railways is developed. The traffic necessary to make the railway system really pay its way will only come with the development and closer occupation of the country. The policy of holding up land for appreciation in value is one of very doubtful soundness. What is ultimately gained in the value of the land may well have been lost through the loss of the traffic which the railway would have had under a system of more rapid occupation of the land. The Canadian Pacific Railway has spent large sums on irrigation works and otherwise preparing farms for settlers, and it pursues, as it has done for many years, a definite, active, and extensive land development and colonisation policy. The Canadian National Railways quite rightly look upon their Land and Colonisation Department as one of the most important. Only growth of population can make the land, which represents potentialities, produce the commodities which are the actualities of traffic. With so small a population as the Dominion possesses, and a natural increase of only some 140,000 a year, a totally inadequate number to provide for the development of a country which has an area of 3,750,000 square miles, immigration is vital. The railway mileage, at a very moderate estimate, is sufficient now for a population of 12 to 14 millions. The railways can do no greater work for Canada than that of supporting the immigration policy of the Government. In doing so they will at the same time do the best for themselves.

CHAPTER IX

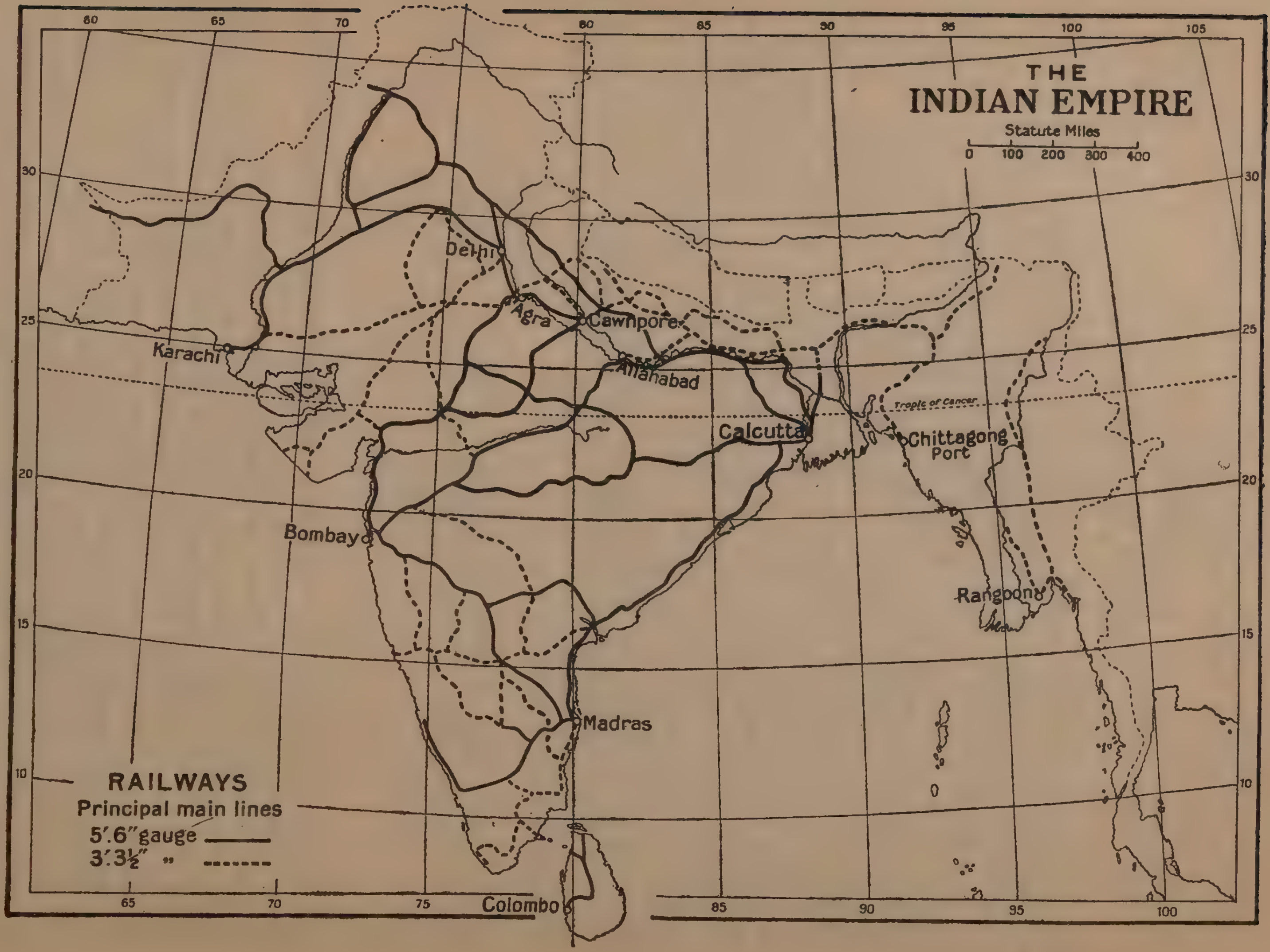
RAILWAYS OF INDIA

INDIA presents another contrast to Canada. Like Canada, it is a country of great distances, as it comprises an area of 1,900,000 square miles, but in contrast with Canada it has a huge population estimated at 320,000,000 persons, so that it is half the area, with thirty-six times the population. The route mileage of her railways is but little over 37,000 miles, of which 3,600 miles are of very narrow gauge, either 2 ft. 6 in. or 2 ft. Most of the railway is single track, the track mileage only exceeding the route mileage by 3,200 miles. So the position stands to-day that this vast country with its huge population has less than 1 route mile of railway to 50 square miles of territory, and to 8,600 persons. If Canada has an excess of railway mileage, India assuredly has a deficiency. Moreover, the efficiency of the railway system has not been increased by the variety of gauges adopted. The earliest railways were constructed on the 5 ft. 6 in. gauge, which it was intended to make the standard. Later, principally on the score of economy, lines were constructed on the metre (3 ft. $3\frac{3}{8}$ in.) gauge. Later, short feeder lines rather similar to the *chemin-de-fer de vicinaux* of Belgium were added on the 2 ft. 6 in. gauge. Lastly, a 2 ft. gauge was adopted for the hill railway to Darjeeling, and further extensions on the same gauge have since been made. The mileages on each gauge in 1922 were as follows :—

		Route miles.
Broad Gauge	(5 ft. 6 in.)	18,211
Metre ,,	(3 ft. $3\frac{3}{8}$ in.)	15,375
Narrow ,,	(2 ft. 6 in.)	3,042
,, ,,	(2 ft. 0 in.)	638
Total		37,266

From time to time sections of line of the lesser gauges are converted to the broad gauge.

The position of the railways as regards ownership and working is unusual. The early railways were constructed and financed by companies under Government guarantees; this was followed by a period of State construction with borrowed money. Then the previous procedure was mainly reverted to, but throughout the State reserved the right to purchase after a definite number of years. This power of purchase has been exercised to such an extent that the Government owns 27,900 miles, leaving 4,400 miles in the hands of Indian States, and but 5,800 owned by private companies. The Government has not, however, operated the larger part of the mileage it owns, but has leased the lines to companies to work. Actually companies work 25,200 miles, whilst



THE INDIAN EMPIRE

the State only works 8,900. This practice of leasing Government railways to companies to work is unusual, and the wisdom of it was investigated by a special committee in 1921.[1] An outcome of the report has been the decision that when the lease of the East Indian Railway comes to an end this year, it will not be renewed, and a similar decision applies to the Great Indian Peninsula Railway when its lease terminates in the middle of 1925. These decisions will add 6,700 miles to the railways operated by the State. No definite decision in regard to a permanent policy has yet been reached, but it is not unlikely that the policy of leasing Government-owned lines to companies will be allowed to end as the tenures expire, though the Government is striving to formulate a scheme for companies domiciled in India.

As has already been pointed out, India is still ill-supplied with railways. The Mackay Committee,[2] referring to the evidence of witnesses who had expressed the view that 100,000 miles of railway might reasonably be reached, remarked that even that estimate of mileage was short of that which would ultimately be found necessary in India. Twenty years ago, when Mr. Robertson made his report on the Indian railways,[3] it was clear that the sum allotted annually for the railways was totally inadequate, depending as it did on the state of the treasury, the money market, and the general conditions of the country at the time. The money, too, was allotted amongst the railways and to certain new projects. No railway knew or could form a reasonably accurate estimate of the sums which it would receive during the next few years, and the annual allotment even was difficult to use to the best advantage, as all unspent balances lapsed at the close of the year. Sometimes the Government found it necessary to reduce a grant whilst work was in progress, involving waste, as the considerable capital sums spent remained unproductive until the works were completed, and sometimes causing serious complications with contractors. The Mackay Committee found that the expenditure on the railways on capital account was quite inadequate and recommended that £12,500,000 should be looked upon as the minimum. It was not that they considered this the right standard—that, Lord Inchcape has stated, they put at £20,000,000[1]—but it represented as large a sum as they thought that it was any use to recommend with a reasonable chance of adoption. Actually the sum allotted fell short of this by over 20 per cent on the average of the next five years, and, though it was nearly reached in the year 1913–14, during the four years from 1915–19 it fell to such an extent that little more than one year's expenditure represented the total of this period. The last three years have shown an expenditure in excess, but the excess does not amount to as much as is represented by the increase in prices of materials and in the cost of labour. So throughout the period the arrears have been piling up on the low minimum recommended sixteen years ago. In the report of the Acworth Committee it is estimated that the expenditure on *existing* lines should be not less than £20,000,000 a year, so the failure to provide for the railways has been greater than the previous comparison indicates. It is not too much to say that the Indian Government has shown itself unduly parsimonious in its expenditure on the railways, with an unfortunate result to the trade and industry of the country in recent years.

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[1] Report of the Committee to Enquire into the Administration and working of Indian Railways 1921. Cd. 1512.

[2] Report of the Committee on Indian Railway Finance and Administration, 1908. Cd. 4111.

[3] Report on the Administration and Working of Indian Railways, by Thomas Robertson. Cd. 1713.

The Acworth Committee took a bold line, and recommended that "the railways should have a separate budget of their own, be responsible for earning and expending their own income, and for providing such net revenue as is required to meet the interest on the debt incurred or to be incurred by the Government for railway purposes."[1] A Committee, known as the "Railway Finance Committee," considered this proposal towards the end of 1921, and came to the conclusion that it was outside the domain of practical politics in the existing state of Indian finance. In considering this decision notice must be paid to the large drafts made on the railways during the War. It was inevitable that for several years the railways were not only unable to carry out the amount of renewals which fell due, but even to effect all the day to day repairs. The result was much larger balances of unspent revenue at the close of each year. A substantial part of this should have been carried to a depreciation fund, but the Government called it all profits, and swept the lot into the income for each year. At a very moderate estimate £12,000,000 should have been available in a depreciation fund at the close of 1921, all accumulated during the preceding five years. The result was that in the year 1921–22, for the first time since 1900, the railways proved a liability instead of a source of revenue to the Government. The deficiency was not quite equal to the net profit to the Government two years earlier, and was almost entirely attributable to the previous appropriation of monies which should have gone to a depreciation fund. It is not quite clear whether the Indian Government wish to return to the pre-War policy of taxing the trade and industry of the country through the railway rates—a penny wise and a pound foolish policy—or whether it is merely nervous that, having raided the railway finances so heavily, the railways cannot stand on their own feet, which is assuredly not the case[2] (see note page 102).

Some intention of improving matters is however shown. The railways are to prepare a programme on a five-year basis, with a capital expenditure of Rs.150 crores (£20,000,000 a year on a basis of Rs.15 = £1). No part of this sum is to be spent on new lines, unless they were already under construction in 1922. An important provision is that there shall be no lapse of money voted for any one year but not spent within that year, such sums being carried on up to the limit of the total amount fixed for the quinquennium. Whilst it is no doubt the intention to vote the total amount to the railway purposes laid down during the quinquennium, there is no absolute certainty that the votes will be duly made year by year. It is therefore an indifferent substitute for the recommendation of the Acworth Committee. Still, it is an improvement on the previous system, when estimates were supposed to be made on a three-years' basis, but, owing to the lapsing of unspent monies at the close of the financial year and the uncertainty of the next year's allocation, the actual basis was one year.

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[1] Acworth Report. Cd. 1512, p. 86.

There have been other burdens thrown on the railways which are not in the interest of trade and industry. One of these is the loss on strategic railways. There are some 1,775 miles of lines forming part of the State-worked North-Western Railway, which were originally built for military purposes. They have, of course, been used for ordinary commercial traffic, and on some of the routes a considerable quantity of such traffic is now carried. These lines have been financed out of the ordinary railway programme. So far are these lines from being reasonable commercial ventures that, even in favourable years, they hardly earn enough to cover their working expenses. In the unfavourable year 1921–22, the deficiency on working expenses amounted to Rs.·82 crores, say £550,000. In addition, interest on the capital outstanding had also to be found, and it is probable that this would amount to at least as much again. This expenditure is clearly not a commercial railway charge, and the burden of it should be shared by the country, and not fastened on the railway industry and its customers alone. It is a point in favour of the change in the attitude to the railways that has taken place that separate particulars are to be kept of these railways, so that the extent of this indirect taxation may be known. It may be perfectly reasonable, as well as convenient, to keep the charges in the railway department, but in that case the railway department should be subsidised out of general funds to the extent of the deficiency on the essentially military railways. It is evident from the annual report on the Indian Railways for 1921–22 that the difference between a commercial undertaking worked by the Government and an ordinary Government Department is not properly understood even by the Railway Board.

Another matter which tends to place an undue burden on the railway customers is the usual Government practice of redeeming debt by means of sinking funds. It is a recognised custom to charge the sinking fund payments on the revenue of the railways. This is considered sound finance, but, if the property is kept in good repair and up-to-date, it results ultimately in the complete redemption of the debt at the expense of a couple of generations, whilst the valuable property still remains. This practice of treating debt incurred for productive works in much the same way as debt incurred for unproductive works may have ill consequences, and in the case of India it has been a contributive cause to the many which have hindered the proper development of the railway system.

From the railway standpoint, until the 31st March, 1922, the railways of India stood almost alone in the world in being in the condition that there had been no general advances in their rates and fares such as the percentage advances which had occurred in Great Britain. From the traders' point of view there was no such distinction, as general surcharges had been placed on goods and parcels traffic. These surcharges did not, however, form part of the railway revenue, but represented taxation on railway transport for the benefit of the general purposes of the country. The railways had to suffer the effects of any diminution of traffic resulting from the higher charges the traders and manufacturers had to pay without obtaining any compensating advantage from the higher charges. From the 1st April, 1922, the surcharges were abolished, and increased rates were substituted. Increases in fares were also authorised. The result was a wonderful change in the position in the year 1922–23. Earnings increased, while expenses were reduced. Judging from the accounts of individual railways further progress is being made during the current year, which bids fair to end with the railways again producing a considerable net profit for the Government.

The deficiencies in the expenditure on the railways have reached such a pitch that on existing lines the traffic has in many parts completely outgrown the capacity of the railway to deal with it. This is no new feature for which the War can be made the scapegoat, but is a matter of long-standing. The complaints of inadequacy and delay were plentiful and vigorous twenty years ago, and year by year as the railways have fallen more and more behind the complaints have grown in number and vigour. Nor does the evidence in regard to them depend on the statements made by members of the producing and trading classes. Leading officers of the Government confirm the position in the plainest terms. Thus Mr. Innes, Secretary to the Government of India, Department of Commerce, stated to the Acworth Committee: " There is a large demand for Indian coal for export, but in the absence of adequate transport facilities for meeting it India is missing an exceptional opportunity of establishing itself in the foreign markets where its coal is in great demand. If adequate railway facilities were provided the production of coal would be increased." Whilst the Coal Transportation Office stated: " The supply of wagons for the coal traffic has long been inadequate." The Mining Engineer to the Railway Board was equally emphatic, adding the information that " the railway difficulty in carrying coal is due to a general incapacity to handle the traffic." Yet coal is so important a traffic that it supplies nearly one-quarter of the total freight tonnage, and nearly a sixth of the revenue. Other trades complain in no less strong terms. The metallurgical industries state their output is reduced, and their development work hindered. The grain trade says that goods lie sometimes for months before wagons are available, and the cases brought forward in support are so numerous that the statement is not open to criticism. More valuable traffics, like sugar and tobacco, were also quoted, thousands of tons of the latter being exposed to the weather and damaged owing to the inability of the railways to transport them.

It is natural that manufacturers and merchants should fix attention on the shortage of wagons. To them it is the one clear visible fact. There are 70,000 tons of traffic waiting to be moved, and the empty wagons supplied in a month are sufficient to move 3000 tons. Clearly the wagon supply was and is unequal to the demands for it, but the whole truth was summed up in the statement quoted above, " a general incapacity to handle the traffic." It is useless to add to the wagon stock unless additional locomotives are added to work the extra trains. It is useless to arrange extra trains unless the stations and marshalling yards are capable of dealing with the additional work which will be thrust upon them, and the running tracks are capable of taking them. Agent after agent, and traffic manager after traffic manager of the railways make it plain that lines and yards were inadequate. Additional stock will do something to alleviate the inconveniences and losses which are resulting from the shortage of transport facilities, but unless the other works are carried out the provision of the stock really required would largely be wasted expenditure.

The position of the passenger traffic is no better than that of the freight. It is admitted by the Railway Administration that " overcrowding does occur to a more or less serious extent on all lines." Shortage of stock is again admitted to be a prime cause, but incapacity to handle is admitted also. Longer platforms are needed in some cases; in others, improved or more crossing places on single lines; in others, nothing short of widening the lines will suffice. The causes are various, and the troubles are local. Practically, however, the cases can all be summed up by the single statement that the Government has year by year been behindhand and has failed to make reasonable provision in advance for the growth in traffic.

Shortage of railway transport has always aggravated a trouble always present in India. Bribery amongst the lower grades of officials is a more or less accepted condition of affairs, but ordinarily in railway matters it is kept within certain limits. A serious shortage in rolling-stock will encourage the custom of bribing with the object of getting an undue share even in the best of countries. In the case of India it has meant that bribery burst all bounds. The railway administration are doing their utmost to bring the bribery and corruption under control.[1] Their efforts, however, will only meet with very moderate success unless the supply of vehicles is made more nearly equal to the requirements.

One change that is taking place on the Indian railways will have results which it is impossible to forecast. In 1913 there were 7,986 Europeans, 10,437 Anglo-Indians, and 614,822 Indians employed on the railways. In 1922 the figures were 6,858 Europeans, 11,831 Anglo-Indians, and 735,789 Indians. The drop in the number of Europeans is part of the policy of Indianising the public services. Considerable progress has been made in the case of the railways, particularly on those which are State-worked. In the superior establishments of the latter, about 20 per cent of the officers are now Indians. It is understood that the present practice is to recruit at least half of the staff for the higher posts in India, so that a substantial further fall in the number of Europeans must be anticipated. If the change is to be carried out without serious ill-effects, it will be essential that adequate facilities be provided in India for the training of the railway recruits. The need for this is recognised, and an experienced officer was placed on special duty to go into the whole question. His report has been submitted, but what the outcome will be is not yet known. The matter is of the highest importance under the existing condition, as the utmost efficiency in the railway service is vital to the country in view of the deficiencies in accommodation and equipment.

It is useless to follow the railway transport problems of India further. There is no remedy for the serious condition which exists there, except for the

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[1] *Vide* Administration Report on Railways of India, 1921–22, pp. 63–64.

Government to spend on the railways with two hands, and this will prove true economy. The growth in industry and trade which would follow on an adequate and efficient railway system and service would so increase the wealth of India that the problems of Indian finance would be simplified. Meantime there is need for the utmost efficiency in the conduct of the service. At present the Indian Government is making efforts to deal with the existing railways on a better basis, but little provision is being made for that extension of the railway system, which is a crying need. India to-day ought to have some 20,000 miles more of railway than she has, and the mileage should still be growing rapidly.

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[2] The Government proposals published since this was written provide for $\frac{5}{6}$ of 1 per cent being paid to the State over and above the sum necessary to take care of the railway capital, so the policy of taxation is to be resumed. They provide at the same time for a separate railway budget.

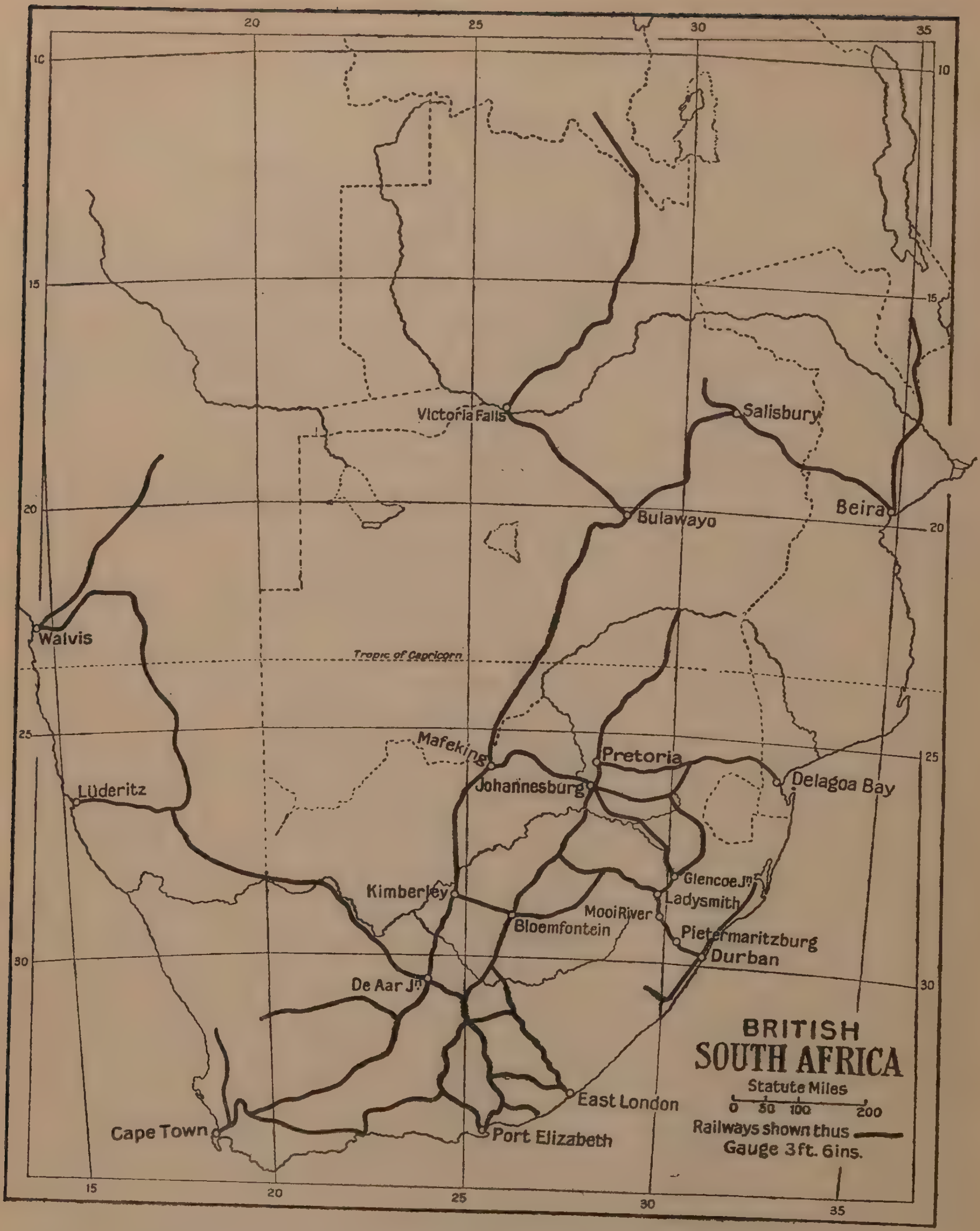
CHAPTER X

THE RAILWAYS OF SOUTH AFRICA

A GLANCE at the map suffices to show that the railways of South Africa are little more than the outlines of a system. The route-mileage in the Union amounted at the end of March, 1923, to 10,297 miles, or 1 mile to every 46 square miles of area. The recently added South-West Province, with an area of 322,000 square miles, has but 1,331 miles of railway, whilst Rhodesia and Bechuanaland with 725,000 square miles have but a few hundred miles. As regards population, in the Union there is 1 mile of railway to 500 persons; in the South-West Province, 1 mile to every 90 persons. On the basis of mileage to population the Union has room for a material extension of its railways. From 1910 to 1916 the railways grew at an average rate of 400 miles per year, a rate of expansion which was not at all too great for the country. The railways are for the most part single line, the track mileage exceeding the route mileage by less than 200 miles.

South Africa has adopted 3 ft. 6 in. as the standard gauge of her railways, but the mileages given above include nearly 1000 miles of narrow-gauge railways (2 feet). As has been pointed out earlier, this 3 ft. 6 in. gauge allows of the running of wider and higher vehicles than can be run on the railways of Great Britain, whilst its adoption in preference to the 4 ft. 8½ in. gauge has saved South Africa a substantial sum in capital expenditure.

In the ordinary way the railways of South Africa pay their way satisfactorily. There was a heavy loss on the Union railways in the year 1921–22, but in the following year, whilst a small deficit is recorded, it is only arrived at after a heavy transfer to the Betterment Fund, and a very exceptional and large contribution in reduction of Stores Stock. As nearly a million sterling had been provided for renewals and depreciation, an amount nearly £370,000 more than the sum expended during the year, the deficiency may be said to be the outcome of most conservative finance. This has been a feature of the Union of South Africa railway management. Partly, at any rate, it may be traced to the Act constituting the Union which made express provision that the railway budget should be separate from the national budget, and that the railways should be run on such a basis that they paid their own way. At the 31st March, 1923, there was an accumulated deficit of £2,221,000 on railways, harbours, and steamships. There was, however, an unexpended balance in the Renewals Fund of £2,039,000, and in the Betterment Fund of £210,000. Moreover, out of the Betterment Fund in that and previous years there had been transfers to Capital Account of £4,032,000. The deficit can be regarded as purely nominal, and the management rather lay themselves open to the charge of either charging unnecessarily highly or not expanding sufficiently rapidly,


BRITISH
SOUTH AFRICA
Statute Miles
0 50 100 200
Railways shown thus
Gauge 3ft. 6ins.
Victoria Falls
Salisbury
Beira
Bulawayo
Walvis
Tropic of Capricorn
Mafeking
Pretoria
Johannesburg
Delagoa Bay
Lüderitz
Glencoe Jn
Ladysmith
Kimberley
Mooi River
Bloemfontein
Pietermaritzburg
Durban
De Aar Jn
East London
Cape Town
Port Elizabeth
10
15
20
25
30
35

in consequence of such cautious finance. The outlook, too, is exceptionally good. For the first five months of the current financial year, the railways, harbours, and steamships, after making provision for depreciation, interest, Reduction of Stores Stock, Betterment and Pension Funds, show a net profit of £486,000. If this is continued throughout the year, half the accumulated deficiency will be wiped out by 31st March, 1924.

Since the Union came into being the railway traffic problems of the railways have fundamentally changed. This is due to changes in the economic conditions of South Africa and in the relative importance of mining, manufacturing, industry, and agriculture. In the first place South Africa is becoming much more self-sufficing. In the eighteen years from 1904, the numbers of cattle and sheep each increased by over 75 per cent; the cultivation of wheat increased until it equals two-thirds of the Union's total consumption; maize remains much the biggest crop, and production has increased by 50 per cent in the past dozen years. The production of fruit has increased until South Africa was able to ship in a year over one million cases of deciduous fruits at Cape Town alone, and nearly a quarter as many cases of oranges and other citrus fruits. This fruit production is well distributed as, although the south-western districts of the Cape remain the largest producers, the production in the eastern Orange Free State is rapidly increasing, whilst the tonnage placed on rail in the Pretoria division is about half that of the first-named. The large increase in the production of vegetables in the Transvaal, which resulted in a traffic of over 20,000 tons, must not be overlooked. The increase in the sugar produced, which has now reached 160,000 tons a year, has not only made the Union self-sufficing, but resulted in 1922 in an export of 18,000 tons more than were imported.

Apart from foodstuffs, coal is becoming a continually growing factor in the railway problem. The total production in the Union in 1906 hardly reached 4,500,000 tons, whilst it now exceeds 10,000,000 tons. As recently as 1911, all South African coal was brought to Cape Town by sea. Last year 159,000 tons from the Transvaal, and 184,000 tons from Natal were brought by rail, and none by sea. This is a heavy long-distance traffic. Further comparisons may be made with 1911, when 398,000 tons of South African coal were brought to Cape Town by sea. Of those 135,000 tons were used for bunkering ships. The local Cape Town consumption would account for less than half the remainder, leaving a considerable quantity of coal for conveyance by rail in the inland direction. The movement of the traffic on the railway has been completely reversed. Needless to say, the 2,250,000 tons of coal required annually by the railways are all South African coal, about 27 per cent being Natal and the balance Transvaal coal.

Considerable light is thrown on the increasing self-sufficiency of South Africa by the purchases made by the railways of productions of the Union. Machinery, permanent way, and bridgework materials, rolling stock,[1] etc., are still almost entirely imported. On the other hand, 95 per cent of the clothing and uniforms; the whole of the bricks, cement, stone, sand, and explosives;

[1] Wagons are an exception—a substantial number now being built in South Africa.

95 per cent of the forage and provender; 60 per cent of the provisions and catering supplies; and in addition considerable quantities of brushware, chemicals and disinfectants, candles and soap, hardware, iron and steel castings (value £51,000), leather goods, matches, rope, etc., are South African productions. These indicate growing manufactures both in quantity and variety.

These great changes have largely reversed the balance of railway traffic. In the early years of the Union thousands of trucks had to be worked empty to the ports to carry high-rated imported traffic to the interior. So desirable was it to encourage traffic in the coastwise direction that lower rates were commonly quoted on no other ground. The position now is entirely reversed. Train-loads of empty trucks are hauled daily from the ports to the interior to carry the large low-rated export traffic in coal, grain, etc., that has been developed. High-rated imported traffic has decreased, while low-rated traffic has enormously increased. The *raison d'être* of the lower rates for the traffic moving coastwise has disappeared. This change in the traffic is reflected in the earnings. As in other countries railway rates were increased on several occasions between 1918 and 1920, whilst in the last-named year a general revision of rates took place. Reductions have since been made from time to time, though not always to the extent that the railway finances permitted and the traffic required. In spite of these reductions, the rates are still sometimes materially in excess of the pre-War rates. Yet so great have been the changes in traffic that the railways are earning a lower revenue per ton-mile than they did in 1913. The following table taken from the Annual Report of the General Manager is evidence of this:—

Period.	Revenue per Ton-Mile.			
	Goods and minerals other than Coal.	Live Stock.	Coal.	Total.
	d.	d.	d.	d.
Year, 1913	1·340	1·524	·384	·859
February, 1922[1] . . .	1·610	2·697	·373	1·008
May and July, 1923[1] . . .	1·266	1·762	·402	·816
Increase or decrease—				
1923 compared with 1913 .	−5½%	+16%	+5%	−5%
1923 " " 1922 .	−21%	−35%	+8%	−19%

The coal traffic, no doubt, has had to bear a material part of the brunt of the changed conditions. Not only have the circumstances which made it a specially attractive traffic, as providing loads in the direction of light traffic, changed so that the coal rate must now frequently provide for the cost of returning the wagons empty, but at times it suffers from having to compete with other traffics for the wagons available. During the export season of mealies the supply of railway trucks is short. The mealie traffic and general merchandise are generally given the preference, and the coal industry is distinctly third. To meet the difficulty many of the collieries have erected large storage-bins, but even with the assistance of these output is often materially reduced for several months. An addition of 760 wagons in the last two years on to a stock of 29,000 wagons is so small for the expanding trade of South Africa as to suggest a doubt whether the administration is not being parsimonious in this respect. When, on a further examination, it is found that half the addition was composed of cattle and sheep wagons, the addition for the general goods and coal traffic seems very inadequate.

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[1] The figures for the years cannot be given as to reduce expense ton-mileage statistics are only partially taken out. This retrograde action is very regrettable in view of the extraordinary changes in the traffic which are taking place.

It is possible that the position is partly due to the desire to have as much of the stock built in South Africa as possible. Altogether, in the financial year 1922–23, 548 goods vehicles were brought into service against 172 scrapped or sold. Of the former 182 were built in the country and 363 imported. At the close of the financial year there were on order 510 goods vehicles, but 6 from overseas, whilst 504 were being built in South Africa. The General Manager in his report comments on the local manufacture of coaches and wagons, saying, "in order that prices may compare favourably with the imported article, alterations in present practice will be necessary." Evidently old machinery requires replacement by up-to-date tools in many cases.

The difficulties with the wagon supply may receive considerable relief from the system of grain elevators which are being erected by the Railway Administration. This consists of two port elevators: one at Durban with a storage capacity of 42,000 short tons, the other at Cape Town of 30,000 tons capacity. Distributed at the chief despatching stations in the grain belt will be 17 elevators varying from 3,000 to 5,800 short tons capacity, and 17 smaller ones ranging from 2,600 down to 1,800 short tons. The total storage capacity will amount to 181,200 short tons or 161,800 tons of 2,240 lb. The Cape Town port elevator and 17 large country elevators are nearing completion at the moment of writing, and the 17 smaller country elevators should be ready for use in July, 1924; so that it is anticipated that a substantial portion of the 1924 maize crop will be handled through the elevator system. The gain, both to the railways and at the ports of handling the grain in bulk, will be considerable, but the gain to the farmer may prove much greater. Once the grain is deposited in the elevator the farmer will receive in exchange a negotiable elevator receipt, which will give a precise account of the weight, description, and grade of the grain. The Railways and Harbours Administration, as the elevator authority, will "absolutely insure the grain against all losses of whatsoever description whilst in the elevator system and will undertake (without any reservation) to deliver, on presentation of the elevator receipt, the exact weight and grade inscribed thereon, less a deduction of 1 per cent to cover wastage and loss of weight."[1]

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[1] South African Railways and Harbours. Report of the General Manager, year ended 31st March, 1923, p. 17.

The elevator receipts will consequently be recognised by the banks as a good security, on which they will advance loans. This will often save the farmer from the necessity of selling grain immediately after threshing, as he cannot afford to wait long for the money, nor face the serious risks connected with lengthy storage. This is not the place to enumerate all the advantages of the elevator system. It may not be out of place though to mention that competent authorities have estimated that, when the elevator system is in full working order, there should be a saving to South Africa of something like £500,000 per annum after meeting interest on capital and working expenses of the elevator system.

An important event which is expected to take place in the course of 1924 is the introduction of electric traction on the 73 miles of the Natal main line from Daimana to Mooi River. This is part of a scheme for electrifying the 171 miles from Glencoe Junction to Pietermaritzburg, with one short branch line, and the whole is expected to be in working order by the middle of 1925. This section of line has steep gradients, which seriously hamper the working of the goods and coal traffic by limiting the train-loads. These trains it is proposed to haul with three electric locomotive units controlled by one driver and an assistant. The following table shows the present loads of the trains worked by steam locomotion, and the intended loads after the electrification is complete.

	Present (steam.)	Intended (electric.)
Glencoe–Ladysmith (42 miles)	1,200 tons.	1,640 tons.
Ladysmith–Mooi River (71 miles)	700 ,,	1,430[1] ,, to
Mooi River–Pietermaritzburg (58 miles)	850 ,,	1,500 ,,

[1] 1,430 tons will be the through load, which will be increased as far as possible towards 1,500 as experience justifies.

The power-house is being constructed at Colenso alongside the Tugela River, 112 miles from Pietermaritzburg, so the current has to be transmitted a considerable distance. Produced at 6,600 volts it will be stepped-up to 88,000 volts for transmission, and stepped-down again at the sub-stations to the original voltage, and then converted into 3,000-volt direct current for feeding the contact wire. This power-station was authorised in 1921 and the work of construction begun prior to the setting up of the Electricity Supply Commission in March, 1923. The functions of this Commission are principally :—

(*a*) The establishment, acquisition, maintenance, and workings of undertakings for an efficient supply of electricity to Government Departments, the South African Railways and Harbour Administration, local authorities, companies, and other persons carrying on industrial undertakings or to any person whatsoever in the Union ;

(*b*) The investigation of new or additional facilities for the supply of electricity within any area and for the co-ordination and co-operation of existing undertakings, so as to stimulate the provision, wherever required, of a cheap and abundant supply of electricity.

This means that, apart from supplying power for the electrification of the railways, etc., power very nearly at cost price will be available for all industrial undertakings as well as for agricultural purposes. The concentration of the production of the power for all purposes should result in its production at a minimum cost. This should make for more rapid expansion of industry. Moreover, from the railway standpoint it will save the railway administration from the necessity of raising the capital for power-houses, when electrification schemes are being carried out.

The first electrification in Cape Colony is being carried out with the object of increasing the capacity of the line for dealing with heavy traffic on the Cape Town-Simonstown branch—a line which deals with the suburban traffic. The reduction in the journey-times anticipated amount to 20 per cent of the times occupied to-day, and this, with the increased service which could be given, is expected to result in a large increase in the traffic, such as has followed electrification of the railway lines near large cities the world over. Moreover, considerable relief to the congested terminal station at Cape Town is anticipated.

The South African railways exhibit one or two remarkable features. With first, second, and third-class fares, the first-class passengers exceed each of the other classes in numbers, a most unusual feature. Moreover, whilst the average increase in the number of passengers since 1909 is 118 per cent, the increase in the first-class is 147 per cent. In the year 1922–23, however, the first-class passengers declined by 5 per cent, whilst the third-class increased by 6 per cent; so perhaps the common phenomenon of the gradual gravitation of the majority of the passengers to the lower classes is beginning to show itself. These 1922–23 results may, however, be traceable to the liberal programme of excursions which was introduced. Excursion tickets at single fare for the return journey are now issued between all South African railway stations during the summer, Easter, and mid-winter holiday seasons. Then, during the winter season (1st May to 31st August) week-end tickets were issued between all stations instead of being issued from certain large centres only as formerly. Evening excursions were also introduced as an experiment for the same period. For both half the ordinary return fares were charged. The experiment proved popular and is to be repeated in 1924. The combined land and sea excursions introduced before the War have been re-started, and promise to become a popular form of holiday travel. The most recent introduction is the special touring train which aims at giving the public an opportunity of becoming more closely acquainted with the attractions, productions and possibilities of the hinterland. The first tour started on the 30th June, 1923, and ended on the 8th July. The fare charged was £8 10s. 0d., which covered 1,090 miles of travel by railway, meals, and bedding on the train and one picnic by motor car. The whole was planned so as to give the passengers frequent opportunities to visit places of interest, and to inspect progressive farms and other forms of industrial enterprise *en route*. So large did the demand for this tour prove that it had to be repeated twice. It is the intention of the management to repeat the experiment in 1924, and to try it in other parts of the Union. It is to be hoped that such enterprise meets with the success it deserves.

Altogether the conclusion may be drawn that the railways of the Union of South Africa are conducted with economy, efficiency, and enterprise. The finance is, perhaps, on the conservative side, and an increase in the rate of expansion seems desirable and justifiable. Outside the Union the railways are still in an early stage of development, in fact, a couple of main lines with a few small branches to mines represent the whole system. It will take many years of development to justify large extensions or to produce a heavy traffic.

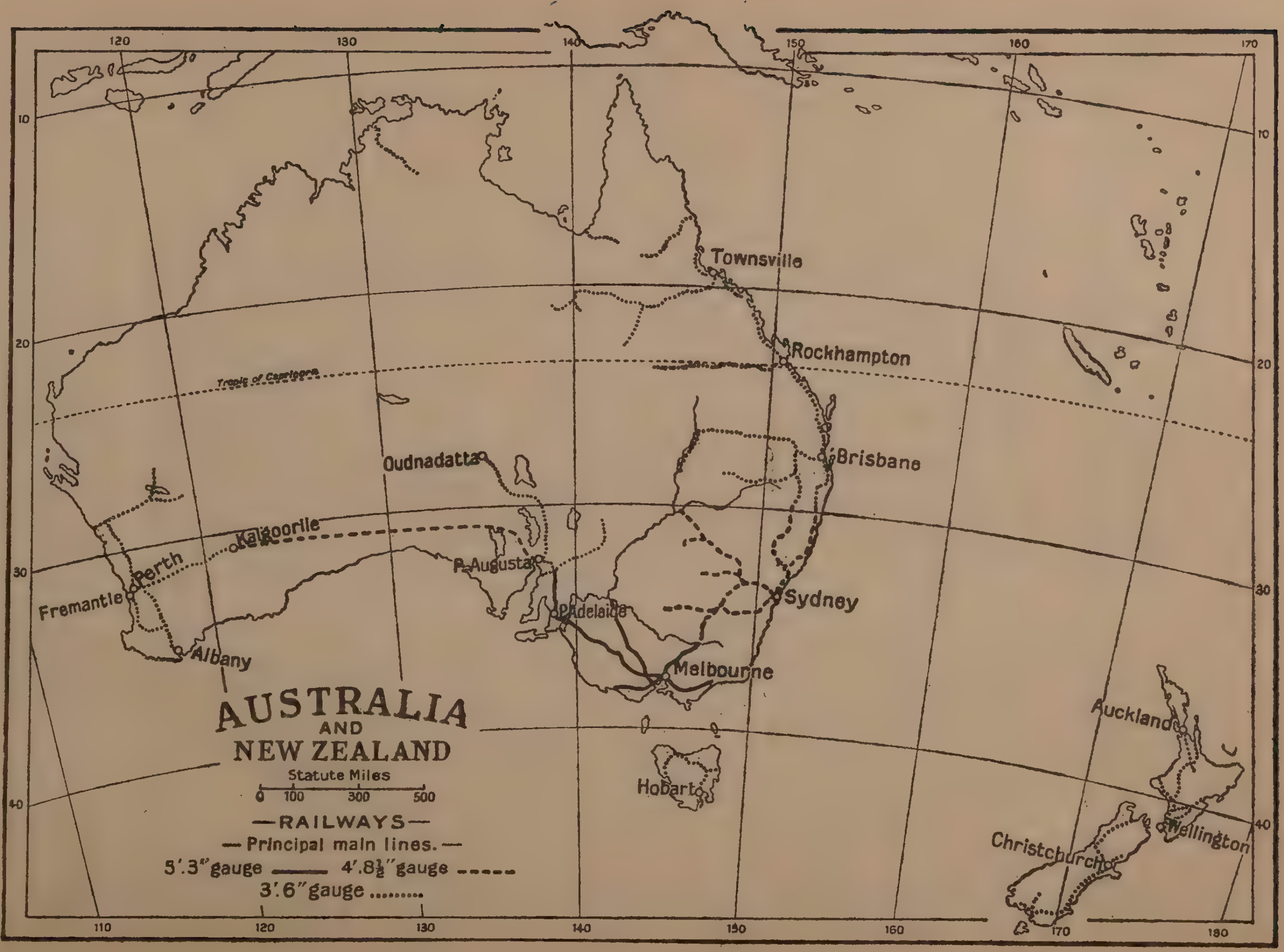
CHAPTER XI

RAILWAYS OF AUSTRALIA AND NEW ZEALAND

The railways of Australia stand alone amongst the railways of the Overseas Dominions, being in no sense a Commonwealth system, but a series of systems of railways for the most part controlled by the individual States which form the Commonwealth, though certain railways built in recent years are the property of the latter. In Canada, the extension agreement to include British Columbia in the Union of Canada in 1871 contained a condition that a trans-continental line should be built, and so uniformity of gauge was practically guaranteed even if the influence of its powerful neighbour had not been sufficient. In South Africa, fortunately, Cape Colony and Natal adopted the same gauge, and so when railways penetrated inland to the Orange Free State, the Transvaal, and later to Bechuanaland and Rhodesia, it was natural that the same gauge should continue. Immediately the Union was formed, the railways of the colonies included were amalgamated into a single system. India has been under British rule throughout its railway history, and the railways have always been under very considerable control by the Government. Whilst more than one gauge is used, and in consequence considerable difficulties are experienced in dealing with certain through traffic, the changes of gauge were decided upon with definite objects in view. In the case of Australia it is not so. Each colony selected its own gauge without sufficient consideration of what other colonies were doing.

The history of this question is as follows. In 1852 New South Wales, against the advice of the then Colonial Secretary, adopted the 5 ft. 3 in. gauge. The neighbouring colonies of Victoria and South Australia, having been advised of the decision, proceeded to follow on the same lines. Then New South Wales reversed its decision, adopting the standard 4 ft. 8½ in. gauge, but without first arriving at any understanding with the other two States. Substantial orders had already been placed for rolling stock on the broad gauge by railway undertakings, especially so in Victoria. Considerable feeling was aroused, and Victoria and South Australia decided to adhere to the broad gauge. Up to quite recent times the change made by New South Wales has stood as an obstacle in the way of a unification of gauges, as the old history was promptly brought forward when the question of who should pay for the gauge rectification came up.

Numerous conferences on the subject of the unification of gauge were held from time to time, but for some years no progress was made. Then in February, 1921, the Governor-General appointed a Royal Commission. The result of the Commission's work was a recommendation that the gauge of 4 ft. 8½ in. should be adopted as standard for Australia. The only means by which such


AUSTRALIA
AND
NEW ZEALAND
Statute Miles
0 100 300 500
—RAILWAYS—
— Principal main lines. —
5'.3" gauge
4'.8½" gauge
3'.6" gauge
Tropic of Capricorn
Townsville
Rockhampton
Brisbane
Sydney
Melbourne
Adelaide
P. Augusta
Oudnadatta
Kalgoorlie
Perth
Fremantle
Albany
Hobart
Auckland
Wellington
Christchurch
110
120
130
140
150
160
170
180
10
20
30
40

uniformity could be secured were, in the Commission's opinion, by conversion of the other gauges. At a conference held in November of the same year of the Prime Minister and the Premiers, the 4 ft. 8½ in. gauge was definitely adopted, and it was also resolved that the adoption of a uniform gauge was essential to the development and safety of the Commonwealth. The following table showing the mileage of line in 1921 at each gauge gives some slight idea of the present complicated condition of the lines :

State	Route mileage having a gauge of							Total.
	5′ 3″	4′ 8½″	3′ 6″	3′ 0″	2′ 6″	2′ 0″	1′ 8″	
	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.
New South Wales	45	5,241	80	—	—	36	—	5,402
Victoria	4,187	—	—	15	122	13	—	4,337
Queensland	—	—	6,055	—	26	931	—	7,012
South Australia	1,124	597	1,721	—	2	19[1]	—	3,463
Western Australia	—	454	4,384	—	—	40	28	4,906
Tasmania	—	—	816	—	—	61	—	877
Federal Territory	—	5	—	—	—	—	—	5
Northern Territory	—	—	199	—	—	—	—	199
Grand Total *	5,356	6,297	13,255	15	150	1,100	28	26,202
* Included are Private Railways for special purposes	29	159	818	4	21	853	28	1,912

[1] Includes 3·6 miles of 2 ft. 3 in. gauge railway.

The estimated cost of conversion of the existing lines on the mainland is £48,355,000, to which must be added £6,250,000 for rolling stock. This will increase the average capital cost of the railways per mile by the substantial sum of £2,300. As the average cost of the Federal and State Railways has been about £10,000, the increase on the capital, on which interest must be earned, will be very material. Further, to get the full benefit of the conversions, certain new lines will be necessary which are estimated to cost a further £2,600,000. Needless to say, the work will take many years to carry out. Even the first stage to provide a main trunk line between Fremantle and Brisbane and convert the 5 ft. 3 in. gauge lines of Victoria and South Australia will cost £21,600,000 and take eight years. The way in which this sum is to be divided between the several States and the Commonwealth shows what a difficult problem the allocation of the cost is.

New South Wales bears the largest share. Queensland and Western Australia are particularly deserving of sympathy. They both adopted the 3 ft. 6 in. gauge for reasons of economy. Except for the benefits of through railway communication, they will lose by the change, as the annual costs of the standard gauge lines will be greater and the existing gauge is all that they require for their traffic.

Division of Costs of Conversion

State.	Total cost of work within State.	Quota.
	£	£
New South Wales	1,657,000	7,095,000
Victoria	8,324,000	4,939,000
Queensland	1,848,000	2,536,000
South Australia	4,674,000	1,632,000
Western Australia	5,030,000	1,078,000
Commonwealth	67,000	4,320,000
	21 600 000	[illegible]

The large capital expenditure is not entirely due to the changes in the line gauges. The loading gauges also differ materially. On the New South Wales railways the maximum passenger rolling stock gauge is 10 ft. 6 in. in width and 14 ft. in height above rail-level. None of the 5 ft. 3 in. gauge lines can take such wide vehicles, but they have about 2 in. more clearance in height. On the 3 ft. 6 in. gauge lines the usual width is about 9 ft. 6 in., and the height about 12 ft. 6 in. The goods rolling stock is usually subject to smaller dimensional limits. The new standard is to be that already adopted on the Federal Trans-Australian Railway, 10 ft. 6 in. width and 14 ft. 6 in. height for both passenger and goods rolling stock. New South Wales is already carrying out work on bridges, tunnels, buildings, and platforms in the neighbourhood of Sydney to permit the use of the larger rolling stock.

The journey from Brisbane to Perth gives some idea of the inconvenience suffered by the passenger who travels by railway from one State to another. The total distance is nearly 3,500 miles, and the passenger has to change his train five times in consequence of the gauge changes. The contrast with the 3000-mile journeys across Canada without any change is striking. The magnitude of the inconvenience can perhaps be better judged from the statement that the inter-State passengers under present conditions are stated to amount to 5 per cent of the 327 millions of passengers carried.

As regards the freight traffic, the transfer of all consignments of traffic from one set of wagons to another is not only a cause of delay, and an addition to the risks of damage, loss, or pilferage, but it definitely increases the cost of transport. Definite charges are made at the junction stations of the inter-State traffic to cover the expenses of the transfer. These charges vary from a minimum of 1s. a ton to several shillings a ton on the higher class traffics. These charges are an addition to the ordinary mileage rates and represent a hard cash penalty the Australian traders must pay for the failure to settle the gauge question in the earlier days of the railways.

The welding of the Australian States into a Dominion cannot be made complete until the unification of the railway system has been effected. This can only be done when the gauges of the main lines at any rate have been converted to a single-standard gauge. As a matter of defence, it is decidedly an important Imperial matter. It is no less important for the development of inter-State commerce within the Commonwealth. For Overseas trade it is of less importance since the bulk of such trade of each State naturally gravitates to the ports of the individual States. Still even here there is reaction as the Overseas merchant visiting Australia will often wish to pass from State to State and the railway transport does not make his journeys as fast or comfortable as they would be under other circumstances. Moreover, ports of other States are in some cases the natural ports, but the railway restrictions hinder their use.

The railways of Australia, like the railways of Canada, have been built distinctly ahead of the population with a definite outlook to future development. Whilst there is only 1 mile of railway to 110 square miles of area, there is 1 mile of railway to 210 inhabitants. If, however, from the railway mileage the 1,900 miles of private railways open for special purposes and not available for general traffic be deducted, there is 1 mile of railway to every 225 persons, which is practically identical with Canada. The two countries stand absolutely in a class by themselves in having built railway mileage so far ahead of the population, which alone can produce a sufficiency of traffic. The frequency with which the net railway revenue has fallen short of the interest charges on the railway loans has caused the railway administrations to raise the question whether the development expenditure ought to be saddled on the shoulders of the railway undertaking.

The question is by no means new. In South Africa the Act constituting the Union provides that, if Parliament shall require the Railway Commissioners to fix rates, or to construct new lines, or extend facilities which in the opinion of the Railway Commissioners will not be commercially justifiable, the Commissioners may appeal to the Auditor-General, who, if he agrees with their opinion, may demand that Parliament shall vote to the Commissioners such a sum as in his judgment is sufficient to meet the cost of the requirements of Parliament. In Victoria the position is not dissimilar. By an Act passed in 1915, the Railway Commissioners are entitled to claim for any loss sustained in respect of railways authorised since the year 1896. Continual references have been made to this Act since its passage by the Railway Commissioners of the other States. In the report for the year 1919–20, the Railways Commissioner of Southern Australia urges upon his Government the passage of a similar measure, adding " the absence of such provision inflicts a burden upon the railways which they should not be called upon to bear." The loss on the development railways was £160,000, or £90,000 more than the deficit shown in the accounts. Two years later, the sum which would have been payable under such provision is again stated, and it is pointed out that it makes the difference between a deficit and a surplus of £47,000. The comment might well be added " that the burden is not one which should be thrown on those who pay the rates and fares, as it has been in years when the railways have produced a surplus, and partially in other years, when the deficit was more than accounted for by development lines."

In spite of this, the rates charged for freight are quite moderate. All the

States do not publish complete ton-mileage figures, but New South Wales, South Australia, and Western Australia do. The average rate in New South Wales for all freight is only 1·10d. per ton per mile, whilst for Western Australia it is 1·95d., the difference being accounted for by a much greater density of traffic in the former case with a 20 per cent longer average haul. The coal, coke, and shale, which constitute over half the tonnage on the N.S.W. railways and is a short distance traffic averaging 41·6 miles, pays a modest three-farthings per ton per mile, whilst the long distance (average 284 miles) grain and flour traffics pay no more than ·55d. per ton per mile. The traffics paying more than 3d. per ton per mile amount to less than 500,000 tons, or a little over 3 per cent of the total tonnage, and to 4 per cent of the ton-mileage, i.e. of the total freight traffic movement. Wool would come within the group were it not for its long haul of nearly 300 miles, which naturally has caused some reduction in the average rate. It is rather unusual to find that the high class traffics are not for the most part the long distance traffics; the average distance which the highest class traffic goes is just half the average distance of the wheat and flour traffic.

It is difficult to compare the rates charged in the different States, as the classification of commodities varies. In so large an area as the Commonwealth, with the variations between the productions of the northern and southern parts, it would be difficult to make an absolutely uniform classification. The appropriate classification of a commodity in one State would impose an undue burden on it in another. Thus, in Western Australia native timber accounts for 19 per cent of the tonnage, and firewood for an almost equal quantity; in New South Wales firewood figures as a lesser, but still substantial traffic, whilst timber does not appear in the list of substantial traffics. New South Wales and Victoria would seem to charge about equally with the important difference that Victorian rates are somewhat lower for distances up to some 150 miles but rather higher for distances over 200 miles. Rates in South Australia run rather higher. Queensland has the lowest rates for agricultural produce, but the highest class rates.

The railways of Australia have been frequently accused of failing to provide an adequate supply of goods wagons. To people who are used to the small shortages which occur from time to time on the railways of Great Britain, the shortages which occur in Australia may well seem appalling. In the former the difference in the tonnage between the heaviest and the lightest months of the year, making allowance for the number of working days, does not amount to 10 per cent normally; whilst an expansion of traffic in a whole year in excess of 10 per cent can fairly be described as phenomenal. In Australia visionaries dream that such stability may come in some far distant golden age. In Western Australia, for instance, it is normal for the freight traffic movement of the heaviest month to be practically double that of the lightest month. It is necessary to realise that grain and flour account for one quarter—or if the coal and corn traffic be deducted, to one-third—of the ton-mileage on the New South Wales railways and that the bulk of this traffic is required to be moved in about three months at the close of the harvest. Moreover, this is only one of the agricultural and pastoral products which are clamouring for transport at the same time. It is financially and economically impossible to provide adequate rolling stock for this period of maximum demand. The wheat crops of New South Wales, Victoria, and Western Australia have now reached a stage when the introduction of the elevator system would be not merely very advantageous to the railways in making for a better spread of the traffic, but equally so to the farmers who have sometimes suffered heavy losses through the bags of wheat lying stacked in the open at the railway stations waiting for wagons. Australia is now the eighth largest wheat producing country in the world, and what South Africa can do for its maize crop, Australia should have done years ago for its wheat crop, which is more than three times as great. It is doubtful whether any of the other grain crops are sufficiently large to justify the system being applied to them, but the quantity of oats now grown in Victoria is deserving of consideration. The problem of how to obtain a better spread-over for the traffic on the railways is probably the most urgent for solution after that of the gauges.

Absence of shelter from the weather for traffic waiting for conveyance is not the sole complaint in this direction against the railways. The old-fashioned, extravagant, and none too trustworthy method of using sheets is still the normal way of protecting goods. Covered goods wagons are still scarce, and the open variety outnumber them by something like fifteen to one. In a country where labour is scarce and receives very high wages, the wagon sheet is not merely an inferior but a costly way of covering goods. Climatic conditions in Australia may make it unnecessary to follow the lead of Canada by making the covered goods van the standard type of wagon, but economy and efficiency will follow a very considerable increase in their number. As the stock of wagon sheets is not shown in the annual railway reports, reference may be made to New Zealand, which has much the same proportion of covered wagons. There the wagon sheets actually outnumber the open wagons. Is more evidence necessary of frequent use? Australia is not New Zealand, it is true, but when a single one of the railway administrations spends over £60,000 in five years on repairs and renewals of tarpaulins, and its total wagon stock—horse boxes, cattle and sheep wagons, covered vans, etc., all included—does not number 10,000[1], the inference to be drawn is obvious.

The passenger traffic presents very different features to the freight traffic. In the first place it is not subject to the same seasonal irregularity. Of course there are the same difficulties as elsewhere at the public holidays, but the monthly variations are very moderate, less in fact than in the United Kingdom. The great bulk of the passenger journeys are made in New South Wales and Victoria and represent suburban travel in the neighbourhood of Sydney, Newcastle, and Melbourne. Out of a total of 327 million journeys made in the Commonwealth in 1920–21, 234 millions were accounted for by this suburban travel. To deal with this traffic it was decided to electrify the Melbourne suburban railways, and work was begun in 1913, but owing to the War it was only completed in 1923, though part of the scheme was working four years before. Altogether 143 miles of railway have been electrified. Experience has already proved that, whilst the public have got a much better service, costly duplications and extensions have been rendered unnecessary for many years.

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[1] If the wagons definitely described as Vans, Boxes, or Tanks are deducted, the number left was 8,700, which included over 500 cattle and sheep wagons.

There are only two classes for passengers, and the ordinary fares charged do not compare unfavourably with those charged in Great Britain. There are, however, two respects in which they differ. The first-class fares, instead of being double those of the lower class, are usually no more than 50 to 60 per cent higher. Then, whereas here it is usual to charge at the same rate for each mile travelled, in New South Wales, Victoria, and Queensland a lower charge is made for a long journey than for a short journey. An indication of the effect can be obtained from the statement that the fare for 500 miles is rather less than four times the fare for 100 miles. The reductions in the earlier stages are slight, the fare for 200 miles showing only a 5 per cent saving on four 50-mile fares. Excursion fares, workmen's and scholars' fares, periodical tickets, etc., are also in existence. Trains on the main lines connecting the capitals are made up of first-rate rolling stock, but on the branch lines the standard of comfort is poor on the whole and the trains slow, due to the bulk of the trains conveying passengers also dealing with goods traffic.

New Zealand presents a much more compact area and is relatively much more densely populated than the mainland. With one mile of railway to every 30 square miles of area, and to every 400 persons of the population, the railways may be said to have just about kept abreast of development. In fact railway extension has almost exactly kept pace with the increase in population since the beginning of the century. Throughout the century the record has been one of almost unbroken progress ; in fact, until the War was ended there was no break in the record. Roughly it may be said that the aim has been to work the railways so as to produce as nearly as possible a return of 4 per cent on the capital, that being considered the average cost to the country of the money borrowed for railway construction. Up to 1910, the average return was hardly 3½ per cent, but after that date the average has been very close to 4 per cent. During the War it apparently rose substantially above, but this was almost entirely due to maintenance work being deferred, the unspent moneys being shown as profits instead of being credited to a special fund for use at a later date.

Taken on the whole New Zealand has been well served by her railways. The trains are worked with commendable punctuality ; the rates and fares charged have not been at all unreasonable having regard to the mountainous character of the island, which has not made railway construction or working easy propositions. As traffic increased in density, opportunities have been promptly taken to reduce rates and so stimulate further growth. On the whole, the railway administration has looked ahead and aimed at providing in advance for dealing with the new traffic as it arose. From time to time, railways built in early days have been re-aligned, improving the gradients and thereby allowing of larger train-loads and more economical working. If sometimes delays in carrying out improvements have occurred, on the whole New Zealand has been well served in the matter of her railways.

CHAPTER XII

ROADS AND ROAD VEHICLES

Of the changes which have taken place in transport in recent times none is more striking than that which has been produced by the application of the internal-combustion engine to the road vehicle. After being used almost entirely for local transport for fifty years, the roads have once again become highways for through traffic, and are to-day probably carrying a heavier traffic than at any time in the past. The roads have assumed a new place in every aspect of the life of the community—commercial, industrial, and social. Nor can road transport to-day be treated as merely complementary to railway transport. For low-grade traffic it is still in much the same position as before except that a few miles have been added on to the limits of operation. Even to-day in Canada wheat must be grown within about 30 to 40 miles of a railway station, otherwise the cost of the road portion of the transport comes to more than the wheat can bear. But for traffics of higher value, which stand in the higher classes for railway rates, the motor-vehicle can often effect the carriage for lower charges than the railway rates come to, even for distances of 100 to 200 miles. Further, there are traffics for which the road vehicle can be considered such a superior means of transport that, even if it costs more, it may represent true economy. The fruit traffic of Kent for the London market might be cited as an instance. The road vehicle is a so much smaller unit than the railway train that its loading is much more easily effected. In consequence, its departure need not take place so early. Gathering the fruit can thus be delayed. Then there is the saving of the double handling to and from the railway vehicle, which cannot do the fruit any good and may cause damage. The result is that the fruit on the average reaches the market in better condition, and so realises a better price. Moreover, the risks of loss, if the fruit is not disposed of immediately, are reduced.

The great problem, with which most communities are faced to-day, is how much the road user, as such, ought to contribute to the cost of providing the road. One extreme view has been voiced by a committee of the Chamber of Commerce of the United States, which inquired into the question last year. Briefly, the decision come to was that the entire cost of maintaining the improved highways of the country should be provided by special taxes levied on the road user. The proceeds of such taxes were not, however, to be used for any other purpose. This carried out literally would mean the taxation of all road vehicles, from the pedal bicycle to the heavy motor vehicle and the traction engine and its trailers. Strictly, it would also include the foot passenger. General local taxation is clearly the best way to deal with the last-named, so that eventually the resolution drives one back to a consideration of the proportion to be charged to local taxation, and the proportion to be levied against the road user as such, the latter being considered to include vehicle owners only. Everywhere it is recognised that the motor-vehicle owners must make a special contribution to the road costs. Various other users make contributions, but there is no such universality as in the case of the motor-vehicle owners.

In Great Britain, except for light licence duties on road locomotives, hackney carriages, and private carriages, road users as such had been free from any special contribution to road expenses for over a generation. It would seem, however, a not inequitable proposition that, when two means of transport are in competition, more assistance from the public purse should not be rendered to one than to the other. A departure from this will inevitably result in unduly cheapening one means relatively to the other, thus producing an uneconomic distribution of traffic between them, and one school of thought maintains that road users are already being put in this favourable position. The railways of Great Britain have received no financial assistance from the public purse at any time—the large grants made by the Government during and after the War being regarded as compensation payments and not as subsidies—though last year, for the first time in their history, in some cases issues of debentures were guaranteed by the Government on condition that the railway companies proceeded as quickly as possible with certain works, which would help to relieve unemployment. It is not certain or very likely that, as the result, any of the railways will ever receive one penny of public money, but it is undoubted that they have been able to raise some millions of new capital on more favourable terms than they would otherwise have received from the money market. This is the full extent of the financial assistance the railways have received.

Road transport, however, stands in a very different position. Without taking into account what exists as the result of centuries of activity in the provision of roads, the expenditure on roads is now about 45 to 50 million pounds a year. For the year 1923, the proceeds of motor-vehicle licences, which have exceeded the million mark for the first time, will amount to over £13,000,000. No precise estimate is possible of the annual expenditure which would be necessary on our roads to-day had the motor-vehicle not been invented. Probably an estimate of £20,000,000 a year would be on the high side. It will be quite safe then to put the extra road expenditure due to motor-vehicles at £25,000,000 a year. So far then from motor-vehicle owners paying their full share of road costs, they are not even as road users paying the extra expense which their presence on the roads has caused. Apart then from the valuable endowment of the roads from the past, the motor-vehicle owners are being heavily subsidised to-day out of the national revenue and the local rates. Towards this subsidy the railway companies, as ratepayers, contribute a substantial amount. So that the extraordinary and uneconomic condition exists that one means of transport, which has not been subsidised, not only has to compete with another means of transport, which is subsidised, but actually has to contribute towards such subsidy. It is actually happening as the result, that some traffic is being conveyed by road instead of by railway, with a saving to the sender's pocket, but at a higher cost when the subsidy through the roads is taken into account. Such a condition is only sound business when an industry is in its infancy. Transport by road motor-vehicle has surely passed that stage in Great Britain.

It must not be thought that a recognition of the fact that road transport is receiving assistance from the public in excess of that granted to another means of inland transport carries with it a view that road transport should be discouraged. The valuable service being rendered by road motor-vehicles can be fully recognised and appreciated at the same time. It is not, however, ultimately in the interest of either road transport or the community that the former should be developed in an uneconomic manner. The hardships inflicted, when steps have to be retraced, may well prove greater than the gain which has preceded. In any case, the very fact that road users in this country have been encouraged for many years to regard the roads as a proper object for provision out of taxation levied on the general public makes it very important that any increase in the taxation placed on the road user as such should be applied gradually and with great care to avoid injustice and hardship. Recent Governments have shown that they are fully alive to the difficulties of the position, and have made use of the services and advice of the responsible organisations of motor-vehicle users and manufacturers when considering the incidence of the motor-vehicle taxation. The injustice of taxation levied wholly by way of licence duties is so obvious that unless some reasonable way of grading taxation by the amount of the use made of the vehicle as well as by its power, seating capacity, or weight, the motor-vehicle owner will have a just grievance even with lighter taxation than to-day.

The matter as it occurs in the Overseas Dominions and Colonies is different, as everywhere the railways have received assistance, often very large assistance, from public funds. The problem is still one of maintaining an equitable balance in the financial assistance given, a task of extraordinary difficulty. If the road is constructed first, the railway finds a partly developed traffic, and clearly requires less assistance than if the order of their coming were reversed. How difficult the problem is may be realised by looking at Canada and her railways. If the balancing of the subsidies to be granted to different railways is difficult, much more is it the case when two different means of transport are in question.

After the question of road finance, the organisation of the control of the roads for construction and maintenance purposes has required much attention of late years. Road traffic is no longer local, and small local authorities are not suitable for controlling roads which now require to be treated as parts of great through highways.

An official enquiry into highway administration in 1902–3 disclosed the fact that English highway administration was split up among nearly 1,900 separate local authorities—132 County or County Borough Councils, 279 non-County and Metropolitan Borough Councils, 812 Urban District Councils and 661 Rural District Councils. These separate bodies have probably increased through new Urban Districts being taken out of Rural Districts, though the extensions of large town boundaries have eliminated some of the former. These bodies exercise jurisdiction over areas which have no relation to the character and extent of the highways included in them. The most important main roads of the country are still maintained and repaired along their whole length by different local authorities, each dealing with sections of a few miles at most. In *The Story of the King's Highway*[1] it is stated that " the majority of the 661 Rural District Councils, and not a few among the smaller of the 812 Urban District Councils, are unable to afford the salary of a qualified road surveyor or engineer." The only co-ordinating Authority is the Minister of Transport, and his power rests mainly on the influence which he can bring to bear on the local road authority through the financial assistance that he can render out of the Road Fund provided by the taxation of road vehicles. There is universal agreement that this is unsatisfactory.

The total mileage of roads in Great Britain amounts to 177,321 miles. Of these, 23,230 miles are Class I roads, the main traffic arteries ; 14,739 miles are Class II roads, good secondary roads. These figures of Class I and II roads only include about one-ninth of the roads in boroughs and London, and in 11,000 miles of these excluded roads will be found many roads superior to and carrying a much heavier traffic even than many miles of roads included in Class I. It is something that the Ministry of Transport is endeavouring to obtain statistics of the nature, density, and weight of traffic on the main roads of the country.[2] Such particulars are essential if the road engineer is to decide correctly what are the most economical foundations and crust for the different roads under his control. Much greater co-ordination than anything yet provided is essential if the great arterial roads of the country are to be of adequate width and to possess appropriate foundations and crusts throughout their length. It is doubtful whether anything short of declaring all Class I roads national roads and giving the Ministry of Transport power to prescribe the character of these roads everywhere will suffice. Such powers could only be conferred if combined with a sufficient financial responsibility for the expenditure ordered. Comparison with road organisations of other countries show that a similar view is held and acted upon in some at any rate.

The view is influencing our Overseas Dominions. India, of course, had the Public Works Department responsible for roads long before the modern motor-vehicle made its appearance. During the larger part of that control, railway expansion was reducing the through road traffic, and so attention was centred chiefly on the roads leading to the railway stations. The change of policy, which motor-vehicles rendered necessary, had not been made, when the roads were handed over to the provinces without any provision for even co-ordinating control. Mechanical transport on the roads is growing, but, so far from the roads keeping pace, progress is slight or even backwards. There are still only 200,000 miles of road maintained by public authority, and the major part of this mileage consists of unmetalled roads. In most of the provinces, except in the immediate neighbourhood of large towns, the roads are deteriorating rapidly.[1] The local bodies are said to be starving the roads for more popular and showy activities. The economic loss caused at present by the inaccessibility of many agricultural districts in the rainy season is great. "Unless the provincial Governments can devote to the roads within their area the necessary attention, and can impress upon municipalities and district boards the disastrous consequence of continued neglect, there is every prospect that in the near future the highway system of India, so far from extending in accordance with the needs of the country, and the increase of motor road transport, will fall into serious disrepair."[1] Reports from local authorities, it is added, do not indicate that the outlook is hopeful. India wants existing roads improved and further roads made, co-ordination of road programmes, and a reasonable priority for the financial outlay necessary.

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[1] *The Story of the King's Highway*, by Sidney and Beatrice Webb, 1920, pp. 243–4.

[2] A Traffic Census of Traffic on Class I Roads in Great Britain was issued by the Ministry of Transport in January, 1924. A census of traffic on Class II Roads was taken in August, 1923, and will be issued when the results have been tabulated.

Canada in her older provinces has passed through the successive stages of labour service, commutation of labour service under parish or township control, county control of a limited system, and finally provincial control to a varying extent. Even in the Prairie Provinces, main and market roads are now being constructed under uniform specifications and provincial directions, and are receiving aid to an amount depending on whether the roads fall within a primary or secondary classification.[2] Further, a system of roads amounting to about 25,000 miles is being constructed in the different Provinces with Federal aid. The entire system is designed to connect at provincial boundaries, so as to form a complete road system covering the whole Dominion. In 1919 the Canada Highways Act was passed, which allotted $20,000,000 for assistance to the Provinces in road building. As a result, about 6000 miles have been or are being constructed up to the present at an estimated cost of $38,000,000. The aid given is 40 per cent of the actual accessary and reasonable cost of construction or improvement of the highway. The construction or improvement is to be carried out according to the terms of an agreement to be made between the Minister of Railways and Canals and the Government of the Province. Thus it is seen that for main roads the Province has been made the unit, and even this unit is not considered adequate without co-ordination by the Federal Government. In this way is Canada assuring that her roads, which now measure 423,000 miles, shall prove a real national system. How much there is to be done is shown by the fact that this mileage, huge as it is, means only 1 mile of road to 9 square miles of area. Further, 90 per cent of the mileage consists of ordinary earth roads. Of the remainder, 34,839 miles are gravel roads; 13,998 miles are water-bound macadam; whilst only 748 miles are bituminous macadam, bituminous concrete, or cement concrete. The bulk of these last two are to be found in the Provinces of Ontario and Quebec, where industrial conditions are more developed, and motor-vehicle traffic is heavy. Important sources of the revenues for roads are registration and licence duties for motor-vehicles, chauffeurs, dealers, etc., each Province having its own scales.

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[1] *Moral and Material Progress and Condition of India*, 1923, p. 179. Cmd. 1961.

[2] Address of Mr. A. W. Campbell, Chief Dominion Commissioner of Highways, to the Public Works, Road and Transport Congress at the Royal Agricultural Hall, December, 1923.

In Australia each State has its own independent road legislation and organisation. In New South Wales roads, bridges, and ferries are under the control of local authorities, except those which may be declared national works. Already a number of miles of road have been so declared. Further roads leading into and within areas which are made available for closer settlement are constructed by the Government prior to their transfer to the local authority. Not only in this way, but also through subsidy arrangements, the Government is exercising a considerable control over road construction and maintenance. The most striking feature is, however, the first-mentioned power to declare roads national. Altogether there are 101,200 miles of road in the State, but only 21,900 miles are metalled, ballasted, or gravelled, whilst 33,380 miles are natural surface, the rest being " cleared only " or " cleared and formed only." In Victoria, local authorities are responsible for all roads, but the Country Roads Board has the duty of surveying all main roads and supervising the local authorities' work on them. As the total cost of constructing and maintaining main roads is paid in the first place by the Treasury, half being subsequently refunded by the local authorities, the supervision can be made very effective. At the end of 1922, 6,500 miles of road had been declared and gazetted main roads, so there was a substantial mileage brought under the control of the central authority. One source of revenue of the Country Roads Board are fees and fines paid under the Motor-Car Act. These produce nearly £100,000 a year.

It is much the same in Queensland, South Australia, and Western Australia. In every case the State has set up some form of control over the main roads. In most cases the Acts have been passed within the last few years, and in all cases it is clear that the form the legislation has taken has been influenced by the developments in road transport caused by the coming of the motor-vehicle. In all, taxes on motor-vehicles are an important source of revenue for road purposes. In all the States the larger part of the road mileage consists of earth roads, and Tasmania stands head and shoulders above all the other Australian States in having half its road mileage consisting of metalled or gravelled roads.

The Union of South Africa has some 68,000 miles of road, of which 19,500 miles are main roads. In addition, there are about 7000 miles of streets and roads under the control of municipalities and village management boards. The main roads are entirely provided out of provincial revenue, so that a national main road system should ultimately result. Only a limited amount of the roads is fit for motor-vehicle traffic. In the Transvaal, for instance, the roads are mainly veldt track improved; whilst in Bechuanaland, 50 miles west of the railway, ox transport is an absolute necessity, only the roads from the railway stations to the principal villages within that range being possible for motor-vehicles.

Whilst roads are the most vital factor in motor-vehicle transport, the extent of its use does not depend wholly on them. Great Britain, for all its road superiority, is a comparatively small user of motor-vehicles having regard to its population. The number of licences issued last year was about 1,090,000; whilst in Canada, with one-fifth the population, and a much smaller mileage of roads really suitable for the use of motor-vehicles, there were issued some 600,000. Doubtless the small distances and the much better supply of railways and tramways partly account for the difference. It is, however, quite as much the case that in Great Britain the possession of a motor for other than business purposes is still looked upon as a luxury for the few. In Canada, in contrast, it is as ordinary a possession of the artisan as a piano or gramophone is here. So many are the artisans who drive to work in their automobiles that huge garage accommodation is becoming an essential part of the modern works. The initial cost of the motor-car is another important item. A car can be purchased in Canada at a lower price than any in this country, while, having regard to the levels of wages, the price here would need to be the lower to bring motoring generally to the same grade of workers. Absence of cheap and ample garage accommodation in our great cities is another contributory factor. It is quite certain that it is only by attention to all these factors that a large home market will be developed. Yet nothing will assist the export trade in motor-vehicles more than a large steady home market on which the manufacturer can rely.

Commercially the use of the motor-vehicle is often not given a fair chance. It is recognised in railway traffic that success depends upon a sufficient, regular, and reliable service. The motor-omnibus undertakings in our large cities recognise this, and organise their services on a basis of regularity and frequency. Indeed, the reliability of the omnibus is so good that it is taken for granted, though actually it results from a thoroughly organised system of inspection and overhaul. The undertakings which have stood the test of time have all found that economy depended upon having as few types of bus as possible, and a considerable number of each type. It is in this way that the London General Omnibus Company and its allies have been able to afford London the finest omnibus service in the world at popular fares. The services provided have been more comprehensive because of the alliances. Competition inevitably tends to concentrate on the routes of dense traffic. This results in an excess of service, and also adds to the congestion of the main thoroughfares. Incidentally it results in depriving many light traffic areas of a service.

A transport undertaking can only carry on a limited amount of development work at a time. The extent of such amount will largely depend on the height of the profits in the areas of dense traffic. If competition reduces this surplus, then a corresponding reduction must be made in the services in the areas of light traffic, in many of which the earnings hardly provide for the out of pocket expenses, much less contribute anything to profits. There can be no question of the direction in which economy lies, and the problem resolves itself into one of control. The public require protection from all possibility of excessive fares, and from any attempt to exploit them by the omnibus alliance economising at the expense of the frequency, regularity, and speed of the service. It is not an easy matter to make such control effective and at the same time to leave the alliance freedom in management. Economy in road space demands that the attempt be made.

As regards the road carriage of freight the present wastes are enormous. The number of firms, traders, and carriers taking part in the work runs into tens of thousands. For economical transport by motor-vehicle the units are usually too small and result in an excessive mileage being run in relation to the work done. The railway companies, before the pooling arrangements made about 1909, used to have each their own cartage staffs, and competed fiercely. It was no unusual thing to see four or five railway drays standing outside one works, and after waiting an hour or more the whole lot did not get as much traffic as one dray could have taken away by itself. The working arrangements first and the amalgamations later have enormously reduced this wasteful competition, and the railway companies have saved thousands of pounds a year, whilst carting as much traffic. It is only necessary to watch the road traffic in the neighbourhood of the London Docks or outside some of the large railway goods stations in the late afternoon and early evening to realise how great the waste must be.

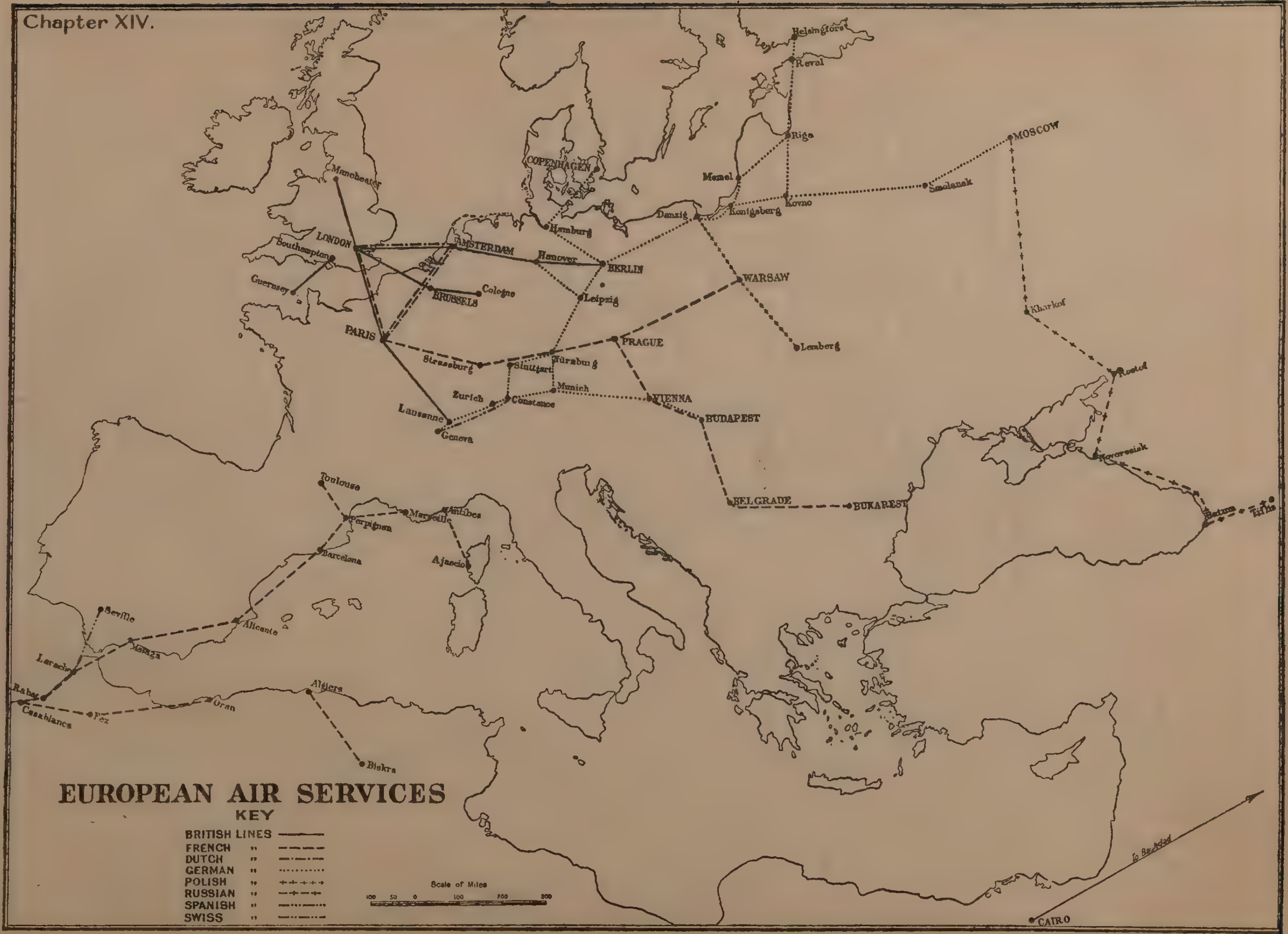
The transport problem is, however, closely linked with that of advertising. No one doubts that the present system of milk delivery by individual dealers from house to house is excessively costly, and imposes an absolutely needless amount of wear on the roads. Yet it would be as difficult to get two milk dealers to combine for delivery purposes as it is to get farmers to co-operate in sending their traffic by railway, though the reason is not identical. Undoubtedly the advertising effected by the passage of the milk cart through the streets does bring business. The economies possible are, however, responsible for some part of the large profits of the multiple milk-shop firms. Even in the great city of London there are very few firms whose transport requirements are on such a scale that the fleet of motor-vehicles required is of a size to give the most economical results. For the most part it is well to admit that the road transport as carried out by the individual has all the disadvantages and costliness of manufacture on a small scale. As transport it is uneconomical, and other considerations must be brought into the account to justify its extravagant cost. In many cases it is doubtful whether the cost could be justified if the full road costs were chargeable directly against the road user. Probably there are very few roads in the county of London which would not be sufficient for all the vehicular traffic, if that traffic were properly organised, and three or four vehicles were not frequently employed to do the work of one. It is extraordinary that road transport is almost the only industry which many small firms and most individuals think that they are quite capable of carrying on by the light of nature.

The problem of road transport in London is to be found repeated in most great towns. The difference is one of degree rather than of kind. Whilst recognising that there is no practicable alternative to the principle that the road must be made suitable to the vehicle, and adequate for the traffic, it is a waste of our resources if excessive and unnecessary expenditure is incurred on the roads and road transport through a failure to organise the latter on the lines recognised as economical in the other transport industries.

Outside the towns, the problems of the road motor-vehicle take rather a different aspect. As distances become greater, the need for considering the return load increases. It is the problem of wagon distribution on railways with two differences. The motive power has to go with the wagon, so that the unit is more costly, and there are no organised receiving centres and agents corresponding to the railway stations and their staffs. The attempts so far made to organise information in regard to loads available for road transport have been few and are only very partially effective.

In many of our Overseas Dominions the country road itself remains a dominating factor. As has been indicated earlier, the larger part of the roads are earth roads, and therefore unsuited to the ordinary type of commercial motor-vehicle. Moreover, it will be many years before most of these can be improved to the standard required. On the other hand, the motor-vehicle which lays its own track as it goes can not only traverse these roads as a rule but some types are said actually to improve them. There should be a considerable opening for this type of vehicle provided that it can be manufactured and operated at a cost not much greater than the ordinary wheeled type. Where the earth road predominates, its use might be encouraged by preferential treatment in the matter of licence duties.

In the less-developed regions of the world it will be many years before the principle that the road must be made suitable to the vehicle can be at all generally applied to motor-vehicles. British manufacturers of motor-cars have lost a large amount of Overseas' custom in the past because they have not recognised this. Clearances, which are ample on the roads of this country, will be quite inadequate on rugged earth roads. The Americans have understood this better, as they have many miles of such roads in their own country. More attention has been paid to this in recent years, but more might still be paid in view of the large market which the Dominions and Colonies offer.



Chapter XIV.

EUROPEAN AIR SERVICES

CHAPTER XIII

INLAND WATERWAYS

THE means of inland communication by railway and road have one common characteristic. Both are capable of going practically anywhere in a country. All parts of a country can be reached by the network of railways and roads. It is merely a question whether there are adequate reasons for incurring the necessary expenditure. Inland waterways are in a different case. In the main, inland transportation by water is confined to natural valleys and flat country. It is possible to construct canals across land rising to a considerable height, but it is not a commercial proposition as the cost of construction is increased much more rapidly than the rise in elevation. As a canal must be maintained at a series of levels, its construction across country of moderate difficulty must involve huge expenditure in deep cuts and large fills to secure the dead level, in frequent weirs and sluice gates for the control of the water, and either locks, lifts, or inclined planes for raising or lowering the vessels. Moreover, the experience in the United States with the Erie Canal shows that the construction of a mile of double-track railway is less than the cost per mile of enlarging the Erie Canal. This may make commercial men pause to think before advocating canal construction as a certain economiser.

A vital matter is the supply and control of water. Rivers, the natural inland waterways, are often very much affected by this consideration for transportation purposes. At times they are inordinately swollen; at times they have little depth as the result of prolonged drought. At yet other times they are closed to navigation owing to ice. These considerations make rivers uncertain means of communication. With canals, the influence is indirect. Their water supply is usually drawn from the rivers, so that drought results in interference with their navigation generally before river navigation is seriously affected. Equally they freeze more easily. In consequence, it may generally be said that factories will not be built along inland waterways unless there is also railway transport conveniently near.

Within the Empire, inland navigations assume the greatest importance in Canada, a lesser importance in Great Britain, and very little importance elsewhere except in isolated cases like the Niger and the Ganges. In both Canada and Great Britain large sums have been spent on the inland waterways in the past, considerable sums are being spent in the present, and in both there exists a substantial body of business men who are urging very large further expenditures. In both the demand for the expenditure is founded mainly on a deep-rooted belief that transport by inland waterway would be considerably cheaper than transport by railway or road. That the transport would be slower is admitted. That the benefits would be limited to sections only of the producing, industrial, and trading community is also not disputed. The belief in the cheapness of the water transport has been fostered by two things in particular. In the first place, where canals and a railway are serving the same places in this country, the charges for carriage by canal are normally lower. This is essential if the canal is to carry any traffic at all, as it is a slower and less reliable means of transport. Cheapness is therefore only evidence justifying further capital expenditure if the canal can show a reasonable return on the capital invested in it at these lower charges. In the second place, the considerable traffic carried on the canals on the Continent of Europe and that there, too, the charges are lower than the railway charges has been considered ample confirmatory evidence. The question to be answered is, " Is the belief justified ? "

There are in Great Britain some 3,800 miles of canals and inland navigations still used. In 1913 the traffic carried over these amounted to some 33,500,000 tons, an amount which was very much the same as twenty-five years earlier. The traffic, too, is for the most part short-distance traffic—from particulars ascertained in 1905 the average distance it is conveyed would appear to be not more than twenty miles. During the War the canal staffs and the carriers were not protected from military service to the same extent as the railway staffs, with the result that the canal traffic dropped to two-thirds of the 1913 figure. A further heavy decline took place in 1921, and though there was a recovery in the following year the traffic only amounted to 19,300,000 tons. On such figures the case might appear hopeless, but, as the canals consist of large numbers of small lengths of varying dimensions, each separately owned, no case can be based on the present-day results.

The Royal Commission of 1906 recognised that no progress was possible unless the canals were united and large sums expended on increasing their capacity by widening and deepening them. The standard recommended as the basis for the improvement was the 100-ton barge, a remarkably small unit compared with Continental or American ideas, and one which would be considered impossibly uneconomical. The routes selected for the experiment are known as the cross—(i) from the Mersey to the Thames at London via Stoke-upon-Trent, Birmingham, and Warwick ; (ii) from the Humber to the Severn via Newark, Nottingham, Birmingham, Worcester, and Gloucester. These two routes were also linked by canals (*a*) by Wolverhampton, Kidderminster, and Worcester ; (*b*) from the Trent, south of Nottingham, by Leicester to the Grand Junction Canal. It has been recently stated by a strong advocate of canal transport that the cost of the improvement " would run out to something like £30,000 to £50,000 per mile, the actual figures being dependent upon the nature of the country through which work had to be carried out."[1] This may be compared with the capital cost of the railways, which works out at £28,800 per running-track mile. The total mileage of waterways involved in the scheme is 544 miles, so that taking an average cost of £40,000 per mile the experiment means an expenditure of £21,760,000. To carry out the scheme for 300-ton barges about double the expenditure would be necessary, and neither in America nor on the Continent is anything less than this considered to have any chance of offering any appreciable advantage over railway transport.

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[1] J. E. Manning Lewis. Paper on Inland Waterways—printed in the *Journal of the Institute of Transport*—February, 1924.

The only part of the scheme on which any work has been done is the Trent Navigation between Nottingham and the Humber. When completed, 120-ton barges will be able to navigate the Trent as far as Nottingham. It is hoped to complete the scheme by the close of 1924 at a total cost of £200,000. The Trent being a broad river, the work necessary was confined to the construction of four locks, of which two are now complete. The cost is mainly being borne by the Nottingham Corporation, and is being carried out as a scheme for finding work for the unemployed quite as much as a commercial venture.

The Canal Commission saw so little prospect of the whole scheme being self-supporting that they came to the conclusion that Government aid would be necessary. Their most generous estimate of traffic development indicated that the least aid required would be that the Government should acquire the existing waterways and present them to the proposed Canal Board free of cost. Even if that were done, the estimated increase in the traffic would have to be greater than comparison with Continental waterways would indicate as probable unless considerably more assistance were given. With the increase in the cost of the scheme due to the rise in wages and prices caused by the War, it would seem that nothing short of half the cost of the improvement, or a subsidy of £20,000,000, in addition to the gift of the waterways as they are could serve. In regard to such subsidies, Sir James Inglis, in a minority report, wrote: "I hold that any question of the application of State funds towards the cheapening of transportation should include consideration of every form of transport, with the object of assisting that form which is best suited to the proved requirements of the trading interests of the nation. In other words, the question of transport must be treated as a whole. It is not within the sphere of practical politics to draw a dividing line between the different forms."[1] If such a large subsidy would be necessary, and only a very modest proportion of the community obtain any benefit from it, the question may well be asked—"what are the grounds for requiring the whole nation to share the cost?"

Continental experience indicates that the subsidies would have to be greater and not less. In France the canals are entirely provided out of State funds. Even this assistance is not considered sufficient, and the railway rates for competitive traffic are not allowed to be reduced lower than 20 per cent above the corresponding waterway rate. In spite of this, the railways can still get a full share of the traffic even in such a low-grade commodity as coal. In Germany 80 per cent of the traffic on the inland waterways is found on the main rivers, which account for only 30 per cent of the mileage. So little is the traffic required to contribute to the inland waterway system that for the whole of the capital, and for 60 per cent of the maintenance and administration costs, the public purse had to be drawn on in pre-War days. Comparisons of charges showed that in most cases, except on the great rivers, the subsidies to the waterways and the large surplus exacted from the railways together almost exactly accounted for the difference between the waterway and railway conveyance charges. The position in Belgium was very much the same. The Continental evidence then is that, except on the large natural waterways, inland waterway transport is not really cheaper than railway transport. One further instance may be cited which is even less encouraging. The Erie Canal in the United States had been enlarged to take boats of 1500 to 2000 tons at a cost of £34,000,000. In 1916 there were carried on the canal 1,600,000 tons; whilst in 1922, after five full years of working the enlarged canal, the traffic had only risen to 2,200,000 tons, barely 1½ per cent of the traffic carried by the railways in competition with it. The result seems very meagre compared with the capital expended on the improvements. Meanwhile the cost is being added to, as the traffic can provide no return on the capital, and the necessary interest is being paid out of taxes levied for the most part on people who cannot possibly benefit from the expenditure.

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[1] Fourth Report of Royal Commission on Canals and Inland Navigations of the United Kingdom, 1909, p. 234. Cd. 4979.

The case for canals, it would seem, must be based on policy reasons. Great play has been made with the argument that there should be an adequate alternative means of transport to railways, and that the need for that has been increased by the grouping of the railways into four systems. There was a good deal to be said in support of this view before the grouping. As the Act which provides for the grouping also sets up the Railway Rates Tribunal, and took the rate-making power out of the hands of the railway companies, the bulk of the arguments in support of the view have lost their force. The Rates Tribunal will be able to completely control any attempt on the part of the railways to exploit by way of charges any advantage arising from lessened competition. Inland waterways in Great Britain would only seem to be an economic proposition in exceptional cases.

The inland waterways have been considered so far as entirely distinct from sea-transport. Inland waterways as an extension of sea-routes, that is, made capable of being navigated by the sea-going ships, may present a different aspect. The Manchester Ship Canal may be given as an instance. The undertaking has cost some £17,000,000. Opened in 1896, after working for 15 years it was unable to make sufficient profits to pay anything on nearly £9,000,000 of ordinary and preferential stocks. The undertaking is now paying a dividend of 5 per cent on its ordinary shares. Allowing for the years that elasped before the dividend-earning stage was reached, the undertaking cannot be considered to have proved a reasonable commercial venture. That Manchester as a city has benefited from the canal's existence there can be no question, but opinions differ as to whether the benefit has been commensurate with the cost, and whether greater benefits would not have accrued from an equal expenditure in some other directions.

In Canada, the canals and improved inland waterways belong rather to the extensions of sea-routes class. The canals either link together the great lakes or are connected with the St. Lawrence, Ottawa, and Trent Navigations. To what an extent the canals are simply improvements to large natural navigations can be judged from the fact that the six most important canal systems only measure 117 miles, whilst the total length of waterways comprised in the system amount to 1,594 miles. The total freight traffic passing through the Canadian canals in 1922 amounted to just over 10,000,000 tons, of which 9,400,000 tons were accounted for by the Sault Ste-Marie, the Welland, and the St. Lawrence Canals, so that the traffic on the rest was of little significance. Two-thirds of the tonnage consisted of agricultural products, chiefly wheat, whilst over 11½ per cent was coal. The traffic is not well-balanced, as 80 per cent is moving in the down direction. The total traffic on the canals has dropped from a high point of 52,000,000 tons in 1913, but the fall is almost entirely accounted for by the transfer of 41,000,000 tons from the Canadian Sault Ste-Marie Canal to the United States Canal. The Welland and St. Lawrence Canals are holding their own, but on all the other canals the traffic is rather tending to decline.

The greatest handicap with which the canals and inland waterways have to contend is the shortness of the season, which extends from about 200 days to a maximum of about 250. In other words, inland water transport is impossible for from four to five months of the year. The three most important canals are usually closed to navigation before the middle of December, not to reopen until the middle of April is passed. At the same time the waterways render a very material service in helping to move the grain in the period between the beginning of the harvest and their closing to navigation, a time when the railways are heavily overtaxed.

The capital expenditure on the canals had by the end of 1919 reached $127,000,000 (say £26,000,000), and more has been spent since, particularly on the Welland Canal. The revenue is so small that it does not even pay the maintenance and administration expenses, so that the traffic passing through the canals is heavily subsidised. Further large expenditure is contemplated on a scheme to make the St. Lawrence navigable for ocean-going vessels the whole way to the Great Lakes. The cost of this scheme is to be shared between Canada and the United States. Canada may well pause to consider whether she is likely to get an adequate benefit for the huge expenditure involved, particularly in view of her own experience and also that of the United States as exemplified in the Erie Canal and the Mississippi. It would seem not unlikely that if Canada can afford to spend the money on transportation that she can spend it to better advantage.

In conclusion, a contrast can be drawn between the policies which are being pursued to-day in regard to inland waterways and the Canadian National railways. Strenuous efforts are being made to increase the net revenue from the latter so that the burden of the capital may be taken entirely off the public purse. No similar effort is being made in the case of the former. The Dominion Government apparently pay the interest on the capital expended and make up any deficiencies in current expenses quite cheerfully, and seem perfectly ready to add to their commitments without any prospect of obtaining any direct return. That it may pay Canada to subsidise the wheat that she sends us through the means of transport is quite understandable, but it is more difficult to understand why one means of transport should be subsidised at a much heavier rate than another when both are well established.

CHAPTER XIV

AIR TRANSPORT

(*contributed*)

EXPERIENCE has shown that all forms of transport have an economic speed limit. The great shipping experts have, after grave deliberation, come to the conclusion that to increase the speed of our merchant ships further would mean an expenditure of millions of pounds, and even then the increase in speed would be relatively small in comparison with the additions which would have to be made to freight and passenger charges. Thus, to be forced to increase charges without gaining a *quid pro quo* in time saved, would obviously be an unprofitable investment, for no one can dispute the fact that cheap sea transport is the backbone of our Empire trade.

The question of further increasing the speed of trains is one of similar difficulty. Here again, broadly speaking, we are faced with the situation that the economic speed has been very nearly reached, if not quite.

BEGINNING OF TRANSPORT BY AIR

This would be a serious situation indeed if it were not for the fact that science invariably forges ahead and opens up the road to further progress. Although the art of flying with a heavier than air machine dates back to 1903, when the famous Wright brothers made their historic first flight, it was not until a few years before the War that this country turned to aviation as a possible means of quickening the ordinary methods of transport. In 1911, the first experimental air mail service in the United Kingdom was run between Hendon and Windsor. This service was organised to celebrate the coronation of King George V. The only important point proved by this short service was the fact that under favourable conditions mails could be transported by air more quickly than by any other means; on the other hand, there was ample evidence to show that, until air transport could be made independent of weather conditions, it could never hope to compete in point of efficiency and reliability with railway and steamship lines.

Owing to the outbreak of War in 1914 all thoughts of utilising aircraft for commercial purposes were naturally abandoned. During the War aviation was given a great impetus forward, which had the natural result of bringing the science to a wonderful point of efficiency for war purposes in a comparatively short time, and in educating the public to some extent to the great possibilities that lay ahead. But, on the other hand, war conditions were so diametrically opposite to peace conditions that when, at the conclusion of the War, civil aviation should have come into its own owing to the great restrictions imposed on sea and land transport, it was found that machines of entirely different design were required for commercial working and that data based on experience necessary to build such machines was not available. The only War product that could in any way be looked upon as a commercial proposition was the big bomber.

A step forward in air transport was made in the Winter of 1918, when a military air mail service was started in France by the Royal Air Force in conjunction with the British Army Post Office. Owing to winter conditions, which proved a big handicap, the service was irregular and the results did not prove promising.

In the Spring of 1919 a regular air mail service was started between Folkestone and Cologne, and for the first time transport of mails by air showed real signs of success. Mails gained as much as twenty-four hours in delivery in some instances, a result which was much appreciated. However, the absence of reliability was still marked.

INTERNATIONAL AIR NAVIGATION

While the War was in progress the potential value of aircraft for commercial purposes had been recognised, and in 1917 a Civil Aerial Transport Committee had been appointed to consider the subject from its international and national aspects.

Largely as a result of the work of this Committee a code of regulations for the administration and control of air navigation was drawn up by the Air Ministry, and at the Peace Conference in Paris, this code became the basis of the International Convention for the Regulation of Air Navigation, which must be regarded as one of the chief instruments of progress of air transport. This Convention recognises the exclusive sovereignty of each State over the air space above its territory, but provides for freedom of innocent passage, except over certain prohibited areas, by the civil aircraft of other contracting States. It contains rules common to all members concerning a great variety of matters in which international uniformity is desirable, such as the registration of aircraft, certificates of airworthiness of aircraft, licensing of personnel, establishment of Customs aerodromes, Customs procedure, lights and signals, rules of the air, maps and ground markings, and meteorology.

Further than this, it provides for the establishment of an International Commission—which is now meeting regularly—in order to carry on the spirit of the Convention with regard to new developments, and very valuable work is being done by this Commission in co-ordinating the organisation for air transport, promoting progress, and smoothing out difficulties. Air transport is thus in the fortunate position, that is shared by no other system of transport, of having an official international body constantly at work to facilitate its development.

Up to the date of compiling this book the States which had joined as contracting parties to the Convention were: Belgium, Bolivia, Great Britain, Canada, South Africa, Australia, New Zealand, India, Bulgaria, Czecho-Slovakia, France, Greece, Italy, Japan, Persia, Portugal, Serbo-Croat-Slovene State, Siam.

THE CROSS-CHANNEL AIR LINES

To-day, more than four years' experience has been obtained with aeroplanes flying on one of the worst routes in the world from the standpoint of weather—the route between London and the Continent—and the aeroplane is beginning to take a recognised place in the world of transport.

A list of the routes operated each year from their opening on 26th August, 1919, up to the end of 1923 will serve to show the broad outlines of the policy followed :—

1919 (from 26th August).

London–Paris	Aircraft Transport & Travel, Ltd.
London–Brussels	Handley Page, Ltd.

1920.

London–Paris	Aircraft Transport & Travel, Ltd. S. Instone & Co., Ltd. Air Post of Banks, Ltd.
London–Brussels	Handley Page, Ltd.
London–Amsterdam	Handley Page, Ltd.

1921.

London–Paris	S. Instone & Co., Ltd. Handley Page, Ltd

1922 (up to 30th September).

London–Paris	Handley Page Transport, Ltd. Instone Air Line, Ltd. Daimler Hire, Ltd.
London–Brussels	Instone Air Line, Ltd.

(From 1st October).

London–Paris	Handley Page Transport, Ltd.
London–Brussels–Cologne	Instone Air Line, Ltd.
Manchester–London–Amsterdam	Daimler Hire, Ltd.

1923.

London–Paris–Zurich	Handley Page Transport, Ltd.
London–Brussels–Cologne	Instone Air Line, Ltd.
Manchester–London–Amsterdam–Berlin	Daimler Hire, Ltd.
Southampton–Guernsey	British Marine Air Navigation Co., Ltd.

The first point that stands out in this list is that in spite of many difficulties and changes there has been a steady expansion of the routes every year, excepting 1921. The lapse in that year was due to a very large increase in the subsidy paid by the French Government to its air companies, resulting in a reduction in fares and rates, against which the unsubsidised British companies were powerless to continue. In March of that year, however, a temporary scheme of subsidies was started to enable the two British companies, who were still ready to operate, to maintain services to Paris.

In 1922 a new, more permanent scheme of subsidies was introduced, the chief feature of which was that three British companies were to share the comparatively large traffic which was growing up on the London-Paris line. Unfortunately the traffic expectations on which this plan was based failed to materialise and the element of competition which it was intended to encourage proved a hindrance rather than a help. Accordingly, as from October, 1922, a reorganisation was made whereby the three British companies were each given a separate route, cut-throat competition between them was stopped and extensions of the routes were provided for. At the same time arrangements were made for the subsidy to be paid to a company to establish a service with seaplanes between Southampton, the Channel Islands, and French ports. This company commenced operations on an experimental basis in 1923.

Much has been learnt in these four years. There was, for example, the question of the flying life of the aeroplane and the pilot, which is intimately bound up with the question of cost. With only war experience to work on, it was estimated that an aeroplane would not stand up to more than about 250 hours of flying and that the pilot's air life would be even less. On that estimate the cost of air transport was reckoned at 6s. per ton-mile. Now, however, it is known that a well-designed and properly looked after aeroplane can fly over 1,500 hours without overhaul and can probably carry out this amount of work in one year, while pilots are able to do 500 or 600 hours in the air per year without ill effects.

Progress in this direction and in the use of more economical aircraft has naturally led to a considerable saving in cost. In August last year (1923) a fleet of four aircraft flying on the London-Paris route covered very nearly 33,000 miles at the rate of 3s. 3½d. a mile, which works out to 1s. 10d. *per ton-mile*. This, of course, was an exceptional month, and the mileage flown was very much greater than the average for the year 1923, but it does show that, given a daily load of from 30 to 40 passengers in each direction per day throughout the year, this route could be made to pay its way on a purely commercial basis at a charge to passengers very little more than the first-class railway and steamer fare.

The safety and reliability of air transport have also been brought up to a remarkably high standard, especially when it is considered that even to-day the engines in use are of a type designed for war use, since engines intended specially for commercial operation are not yet available. The good results obtained are the reward of the extreme care which is taken in every detail of organisation.

It was found that in most cases engine failures were due not so much to the engine itself as to some detail of the engine installation, and one by one these causes of failure were eliminated. Simultaneously, the system of inspection of aircraft engines and instruments was tightened up and has now been brought to a fine point of efficiency, so that any defect in running or sign of wear is detected in the early stages. Probably no other machine receives more careful attention than an aeroplane in commercial operation.

Of equal importance to safety and reliability is the advance that has been made in "ground organisation." A very carefully organised system of ground services, comprising directional wireless, wireless communications, weather reports, aerodrome lighting, route marking, etc., is required to ensure the regular running of an air line, and responsibility for the provision of these services has been undertaken by the Government.

Every aircraft flying on the regular routes is fitted with a radio-telephone and is in constant communication with ground stations. On the British sector of the routes a system has been established for the control of the movements of all aircraft in the air by a Traffic Control Officer at Croydon Aerodrome. The machines are required to report their position at fixed intervals along the route and the traffic officer plots these positions on a chart so that he is able to keep a constant check on the location of the aircraft. He supplies the pilots with information regarding the presence of other machines in their vicinity and regarding the weather in front of them, particularly at the aerodromes for which they are bound. Further than this, if a pilot loses his way in very thick weather he can call for his position as determined by bearings taken by the wireless stations at Croydon and Pulham (Norfolk), or his bearing from Croydon only can be given if required.

This wireless organisation has proved a great benefit to pilots and is helping more than any other single factor in removing the difficulties caused through fog.

Fog is the greatest enemy of reliability in aeroplane transport, and it is particularly persistent on the British sectors of the routes in operation. It is not unsurmountable, however. More reliable engines in conjunction with wireless direction finding will remove dangers from fog whilst in the air, and the difficulties of landing in fog will be overcome either by improvements in the methods of guiding a pilot to his landing place when in the vicinity of the aerodrome or by providing alternative landing grounds so placed that one at least will always be clear of fog. A point to consider in regard to this latter plan is that, when longer distances are traversed by the air lines, the greater saving of time accomplished will permit the use of aerodromes situated further away from commercial centres if freedom from fog is thereby attained.

Even to-day with the limited means of preventing the interruption of services by fog the reliability of the British services is 91 per cent (i.e. percentage of efficient flights to total flights commenced).

Passengers.—Up to the present the carriage of passengers has been the mainstay of the traffic. By the end of 1923 the total number carried to and from the Continent by all lines, British and foreign, reached the high figure of 45,531. That a steady annual growth is taking place in the number of people willing to travel by air is shown by the following table :—

	Passengers carried in		Per cent carried in British aircraft to total carried.
	British aircraft.	Foreign aircraft.	
Aug.–Dec., 1919 . .	870	52	95·4
Jan.–Dec., 1920 . .	5,799	584	90·9
,, 1921 . .	5,256	5,475	48·9
,, 1922 . .	9,490	2,869	77
,, 1923 . .	11,947	3,189	79

A notable point about the above table is the large proportion of the total traffic carried in British machines, thus showing how the history of the mercantile marine is repeating itself in air transport and passengers are showing a preference for travelling in British aircraft where they can. An excellent record of safety has been set up by the British lines. There was one fatal accident in 1920 and no other fatality until the accident on the London-Manchester route in September, 1923; that is only two fatal accidents and five passengers killed in four years constant flying.

Passenger traffic at present suffers from the disadvantage that it is very seasonal. While in the Summer there are often more passengers than the lines can cope with, in the Winter the traffic drops off badly. This is no doubt chiefly due to the fact that the majority of passengers at present are people travelling for pleasure. As the lines are extended and become more attractive to business people this wide fluctuation will tend to disappear.

Goods.—Goods traffic has been rather neglected until recently, the companies having found that it was easier and more profitable to handle passengers. This branch of traffic is, however, less seasonal than passenger traffic, and as the air lines are able to show a large saving of time over the ordinary goods services it is certain to become a more important item in air transport when the advantages offered are better known. The ordinary services are always subject to several days' delay in clearing Customs, whereas the air lines can get clearance immediately.

Towards the end of 1923, between London and Cologne, about a ton of goods was being flown each way daily at rates which paid better than a full load of passengers.

Mails.—The transport of letter mails has, with a few exceptions, proved disappointing. The distances to Paris, Brussels, and Amsterdam were too short to allow an appreciable saving of time. The advantage a passenger may gain by using the air is not fully shared by letter mails, for the reason that collection and delivery must add considerably to the air time. Further, the bulk of business correspondence is posted at the close of the business day, and on these short journeys the air services flying during business hours cannot hope to attract more than a very small proportion of the postal traffic.

When the lines were given a wider radius of action the results began to show a marked improvement. For instance, in 1920 the London-Paris line was extended by a French company to Marseilles. This permitted the posting of late letters for India up to 11 a.m. in London on the morning following the general despatch, and as a result one day's Indian mail posting was equal to the rest of the Paris air mail for a week. Unfortunately, this extension had to be discontinued for reasons of economy. Again, when the Brussels line was extended to Cologne and the Amsterdam line to Berlin, the air mails at once began to increase.

With regard to parcel post the conditions are entirely different, and the results have been most promising. In this case a large saving in time is gained owing to the freedom of the air services from Customs delay, as already mentioned. Moreover, delivery of the parcels is undertaken by the air transport companies themselves. So far the air parcel post has been confined to parcels for Paris and Amsterdam.

The following summary of air transport statistics illustrates in as clear a way as possible the growth of civil air transport operations up to the end of 1923.

CROSS-CHANNEL AIR TRANSPORT—BRITISH AND FOREIGN

Between Great Britain and France

	1919. Aug.-Dec.	1920.	1921.	1922.	1923.	Total.[1]
Machine flights—						
British aircraft . .	364	2,073	957	2,066	933	6,393
Foreign aircraft . .	64	657	1,565	1,463	1,069	4,818
Passengers carried—						
British aircraft . .	689	5,178	5,228	7,612	7,179	25,886
Foreign aircraft . .	52	486	4,352	2,306	2,198	9,394
Cargo carried, tons[1]—						
British aircraft . .	—	—	—	139·2	87·8	227·0
Foreign aircraft . .	—	—	—	235·4	398·3	633·7

Between Great Britain and Holland (and Germany, via Holland, from May, 1923)

	1919. Aug.-Dec.	1920.	1921.	1922.	1923.	Total.[1]
Machine flights—						
British aircraft . .	26	496	2	102	638	1,264
Foreign aircraft . .	—	5	366	580	556	1,507
Passengers carried—						
British aircraft . .	25	364	2	213	1,736	2,340
Foreign aircraft . .	—	—	480	562	976	2,018
Cargo carried, tons[1]—						
British aircraft . .	—	—	—	2·2	20·0	22·2
Foreign aircraft . .	—	—	—	59·4	66·8	126·2

Between Great Britain and Belgium (and Cologne, via Belgium, from October, 1922)

	1919. Aug.-Dec.	1920.	1921.	1922.	1923.	Total.[1]
Machine flights—						
British aircraft . .	68	267	52	717	985	2,089
Foreign aircraft . .	—	104	421	2	391	918
Passengers carried—						
British aircraft . .	129	253	26	1,665	3,022	5,095
Foreign aircraft . .	—	98	630	1	12	741
Cargo carried, tons[1]—						
British aircraft . .	—	—	—	41·4	218·9	260·3
Foreign aircraft . .	—	—	—	—	33·8	33·8

[1] The figures for cargo carried refer to 1922 and 1923 only.

Total : All Cross-Channel Routes

	1919. Aug.–Dec.	1920.	1921.	1922.	1923.	Total.[1]
Machine flights—						
British aircraft	467	2,854	993	2,891	2,559	9,764
Foreign aircraft	64	768	2,404	2,048	2,016	7,300
Total	531	3,622	3,397	4,939	4,575	17,064
Passengers carried—						
British aircraft	870	5,799	5,256	9,490	11,947	33,362
Foreign aircraft	52	584	5,475	2,869	3,189	12,169
Total	922	6,383	10,731	12,359	15,136	45,531
Cargo carried, tons[1]—						
British aircraft	—	—	—	182·8	326·7	509·5
Foreign aircraft	—	—	—	294·8	498·9	793·7
Total	—	—	—	477·6	825·6	1,303·2
Value of goods imported and exported : All Cross-Channel routes	£ 90,936	£ 1,028,812	£ 571,300	£ 713,020	£ 776,251	£ 3,180,319

IMPERIAL AIR TRANSPORT COMPANY

The recent formation of the Imperial Air Transport Company is a step of the highest importance to air transport development in the Empire. Whereas in the past the operating companies have worked under schemes of State assistance of short duration and offering little inducement for the investment of capital and the establishment of sound foundations, the new Company, in which the four former companies will be merged, will start with an assurance of State aid for at least ten years and will be in a position financially and technically to proceed with the work of development on a broad and far-seeing basis.

With regard to the much-discussed question of subsidies it must be emphasised that the adoption of the principle of State aid was unavoidable. In the first place, owing to the action of foreign Governments in subsidising their air companies, it was impossible for competing British companies to survive without similar Government support; secondly, it was certain that unless this support was forthcoming the experimental period before air transport could begin to be of service to the community would be unduly protracted; and thirdly, the grant of subsidies appeared to offer a cheap means of raising a reserve of air personnel and material as a measure of defence.

The new scheme of subsidy under which the Imperial Company will operate is designed to meet each of these factors at the minimum cost to the State and at the same time to avoid the lack of enterprising and resourceful management which is associated with any form of State control.

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[1] The figures for cargo carried refer to 1922 and 1923 only.

Without going too deeply into details a broad idea of the conditions under which the Imperial Company will work can be given as follows :—

Capital of £1,000,000 will be subscribed, one-half by the British, Foreign, and Colonial Corporation, and one-half by the public. The Government will advance £1,000,000, divided into ten annual instalments of gradually decreasing value, and will be represented in the Company by two directors. The advances made by the Government will take the form of a loan, free of interest, and when the profits of the Company exceed 10 per cent, one-third of the balance will be devoted to repayment of the advances, the other two-thirds being allocated to development work and distribution among the shareholders respectively.

The Company will have the sole right of subsidies for heavier-than-air air transport services in Great Britain and Europe. During the first four years the Company must fly a minimum annual mileage of 800,000 and for the further six years a minimum of 1,000,000 miles each year. All the pilots and 75 per cent of the technical personnel must be members of the Air Force Reserve or the Auxiliary Air Force.

What the launching of the new Company really means is that air transport has passed out of the stage of trial and experiment and—given the support of the business world—is about to embark on a career of usefulness and healthy progress.

On the support received from the business community the whole of the Company's success will depend. It is an unfortunate fact that at the present time business men as a whole cannot accept air transport as being a normal and sensible means of progression, and to this attitude is due the continued inability of air transport to maintain itself without a subsidy from the Government. On the one hand business men will not support air transport fully until they are convinced that a safe and reliable service is given at a reasonable charge, and on the other hand air transport cannot be made to pay until it is supported wholeheartedly by the business world.

Therefore the aim of air transport must be constantly to improve the facilities it has to offer and, where possible, to provide something that business men cannot well afford to ignore. How is this to be done ?

FUTURE DEVELOPMENT OF THE CROSS-CHANNEL LINES

The air lines to Zurich, Cologne, and Berlin are in fact an invaluable aid to commerce that no business man should fail to consider, but they represent very nearly the maximum service that an aeroplane can render at present in one day's flying from London—a flight of say 600–800 miles. Only by the establishment of night flying can the services usefully be extended much further, and this development must therefore be counted as one of the chief objects of air transport. At the present time the arrangements for night flying have not been brought to that stage of reliability necessary for practical purposes, but successful trials have been carried out in this country, and it has been shown that there are no difficulties that cannot be overcome in course of time.

The main question to-day, therefore, is how, until night flying is possible, can the air lines be made more effective ? The answer to this question seems to be that the air must co-operate with the railway and the sea. By day the aeroplane can travel up to 800 miles—more than twice the distance covered by the railway train ; by night the train can carry onward the work of the aeroplane. Together, up to 1000 miles can be covered in twenty-four hours. The United States Air Mail Service has been organised so as to demonstrate very clearly the value of such co-operation.

There must be many routes in Europe which could be organised on this basis, and the following example shows the remarkable saving in time that might be expected :—

A passenger might leave the North of England by the night train to London, arriving next morning in time to catch the aeroplane flying from Croydon to Berlin. After a few hours' rest in Berlin, the night train might be taken for Dantzig and Königsberg, reaching the latter place next morning. Thence the journey might be continued by air to Moscow. The through trip would occupy a total elapsed time of about forty hours, and the saving in time would amount to several days over the best alternative route. In the Summer a passenger starting from Manchester might fly the stage to London on the morning of his departure for Berlin, thus getting in a night's rest before starting and still further reducing the elapsed time for the journey.

It is of interest to note that this route, England-Moscow, was in fact in operation, although not organised as a through route, during the Summer of 1923. Unfortunately, the time had not arrived for the establishment of a through service of mails, but this may be a development of the near future, since the route will be again working in 1924 and may henceforward be continued throughout the year.

PROGRESS IN THE DOMINIONS

Unlike the British Isles, which cover a small area, the Dominions have a wide scope for utilising air transport. Australia, with her bad communications and good climate has almost ideal conditions for making a success of air transport, and she has been quick to turn this advantage to account. A line now runs with a high degree of efficiency between Geraldton and Derby, a distance of 1200 miles along the west coast of the Dominion. Heretofore the sole means of communication between these places was a slow steamship service whose average time for the trip from Perth to Broome was eleven days as compared with the present time of two days by air, which thus shows a saving of nine days. An extension from Derby to Wyndham is under consideration. One lesson to be learnt in this case is that by speeding up communications by means of the air, more business will eventually be transacted which will increase the freight to be carried by sea.

Another important line is the one which runs between Charleville and Cloncurry (560 miles), linking up the inland terminals of railways running from the seaboard towns of Brisbane, Rockhampton, and Townsville. Until this air link was organised all mails and passengers between one railway head and another had to be carried by stage coach. This is an admirable illustration of the application of the principle of rail and air co-operation in the Dominions.

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The following table shows the work done by the above-mentioned services from the commencement of regular operation up to 30th June, 1923 :—

Item.	Geraldton-Derby (since 5/12/21)	Charleville-Cloncurry (since 2/11/22)	Totals.
Miles flown	154,680	41,105	195,685
Hours flown	1,933	533	2,466
Passenger miles flown	76,290	25,045	101,785
Letters carried (approximately) . . .	120,000	9,000	129,000
Distance covered in each weekly return trip .	2,400	1,160	3,560
Contract payment per annum (subsidy) .	£25,000	£12,000	£37,000

Two additional services, Sydney-Adelaide and Sydney-Brisbane, are being organised and are expected to be in regular operation shortly. There is also in view the establishment eventually of a trans-Continental service between Adelaide and Perth, which distance should be covered in about eighteen flying hours.

An air service which demonstrates the successful employment of air transport over very difficult country—and is also an example of sea and air co-operation—is the one operated fortnightly by the Royal Air Force between Cairo and Bagdad. For a distance of over 500 miles this route passes over the desert, which must be traversed in a single flight.

Before the air route was organised the mails for Iraq and North and West Persia had to go by sea by way of Aden, taking on an average twenty-five days to reach Bagdad from London. The air service is scheduled to carry the mails from Cairo to Bagdad in two days and a saving of from fourteen to nineteen days is therefore made on correspondence to and from England.

The large weight of mails carried is evidence of the fact that people are willing to support air transport when a good return is given for the air mail fee charged. The only other air mail service existing at present which is comparable with the Cairo-Bagdad service in point of time saved and volume of traffic carried is that between Toulouse and Casablanca, operated by a French company, and the results of these two services in terms of mails carried are accordingly shown together hereunder :—

Weight of Mails Carried. Cairo–Bagdad and Toulouse–Casablanca

	Six months ending 30/6/22 Tons.	Six months ending 31/12/22 Tons.	Six months ending 30/6/23 Tons.	Six months ending 31/12/23 Tons.	Average weight per month (Six months ending 31/12/23) Tons.
Cairo–Bagdad . . .	2·5	3·6	5·0	5·1	·85
Toulouse–Casablanca . .	11·3	22·3	27·7	28·6	4·75

The utility of aircraft in the Dominions is not confined to speeding up communications but has been turned to many other spheres of activity. For instance, in Canada, where timber is one of the greatest of natural resources, forest fires have proved most destructive, and, owing to the huge areas of forest involved, no system of observation in the past has proved capable of locating a fire in the early stages with any certainty and, in addition, no method of transport has been able to get the forestry men quickly enough to the scene of action; but by the use of aircraft these difficulties have to a great extent been minimised.

Again, in the big unsurveyed regions of Canada where no means of transport exist except the canoe, and that during a comparatively few months of the year, aircraft can carry out preliminary surveys and valuable records can be obtained by the use of the aerial camera. It needs no imagination to see how air transport used in these ways, and in many others too numerous to mention, helps directly and indirectly to bring prosperity to a country which shows initiative in making full use of aircraft.

THE FUNCTION OF AIRSHIPS

We now come to the question of how aircraft can be used to quicken communications between Great Britain and the Dominions.

Naturally, the bulk of our freight must, as in the past, be transported by sea. The cheapness of sea transport is one of our greatest assets. But the low speed of this method of transport is becoming more and more a handicap in the carriage of mails and passengers, whose principal requirement in the stress of modern commerce is speed.

Therefore, since greater speed cannot be obtained from steamships except at such a large increase in cost as to be uneconomical, it is safe to assume that when airships have had the opportunity of proving their capabilities of flying over the Imperial routes, the Empire will turn to airships for the quickening of her communications which is so necessary.

Mails, first-class passengers, and certain classes of goods can be carried by air, while steamships and trains can continue to carry the great bulk of freight and those passengers to whom time is of less importance. It is improbable that airships will ever become freight carriers, except in special cases, as although it is expected that they can be operated at the same cost as fast steamships they will never approach in cheapness of running the slower freight-carrying steamships.

The case for the airship as a vehicle for fast, long-distance transport was excellently put in a paper read by Major G. H. Scott before the International Air Congress, London, 1923. After pointing out that the airship will tend to increase in size and in performance to a limit as yet impossible to forecast, Major Scott said:—

> "The limiting factor in the case of the steamship depends upon the amount of business available that is prepared to pay for high speed. This same factor will no doubt affect the airship, but owing to the fact that the airship to-day can provide a speed of 70 miles per hour for the same price that a steamship can provide a speed of 20 miles per hour, the range of the airship being equal to or greater than the fast steamship, and

> that the airship can run at a profit on a route where the available business is very much below that which the steamship requires, this limit is not in sight.
>
> The point to realise is that in high-speed, long-distance steamship travel, the weight of the passenger is a very minor consideration, and in order to carry the fuel for a fast service it is necessary to provide a ship that is altogether out of proportion to the weight of passengers it carries.
>
> The displacement of the *Aquitania* is 53,000 tons, and the number of passengers it carries is 3,230, so that displacement per passenger is 16·4 tons.
>
> The displacement of the airship we have considered is 150 tons, and the number of passengers is 200, so that the displacement per passenger is ·75 tons.
>
> The weight of fuel consumed per passenger-mile for the steamship is 1·2 lb. and for the airship is ·09 lb.
>
> In view of these figures it is probable that with increase in size, and increased number of ships using the bases, the airship of the future will not only be the fastest long-distance craft, but also one of the cheapest forms of fast long-distance transport.
>
> In this case practically all long-distance passenger traffic which requires and can pay for speed will be carried by the airship."

The limitation of the speed of steamships caused by the factor mentioned above is felt most strongly on the route to Australia, and it would appear that on this route airships offer a cheaper and far more effective means of increasing the speed of communication than the running of faster steamships. The saving of time achieved by the use of airships of 150 tons displacement would amount to an average of 66 per cent. Such airships would have a gas capacity of 5,000,000 cubic feet, a speed of 80 miles per hour, and could carry 200 passengers and 11 tons of mail and freight over a distance of 2,500 miles.

With this range the route to Australia could be flown in five stages. Allowing an ample margin for adverse winds, the time saved on each stage would, on figures given by Major Scott, be as follows :—

Comparison of Existing Times of Transit and Airships

	Present day.	Airship.	Saving.	
England to Egypt	5 days.	2½ days.	2½ days.	50 per cent.
„ Bombay	15 „	5 „	10 „	66 „
„ Rangoon	19 „	7 „	12 „	64 „
„ Singapore	23 „	8 „	15 „	65 „
„ Perth (W.A.)	26 „	11 „	15 „	58 „
Egypt to Bombay	9 „	2½ „	6½ „	72 „
„ Rangoon	13 „	4½ „	8½ „	65 „
„ Singapore	18 „	5½ „	12½ „	69 „
„ Perth (W.A.)	20 „	8½ „	11½ „	57½ „
Bombay to Rangoon	4 „	2 „	2 „	50 „
„ Singapore	9 „	3 „	6 „	67 „
„ Perth (W.A.)	12 „	6 „	6 „	50 „
Rangoon to Singapore	5 „	1 „	4 „	80 „
„ Perth (W.A.)	23 „	4 „	19 „	83 „
Singapore to Perth (W.A.)	17 „	3 „	14 „	82 „

Average saving, 65 per cent.

At the time of writing the Government have before them a scheme for the organisation of an airship line over this route. In the first place, a service would be run from England to India, additional stages being added subsequently when sufficient experience was gained. No decision has been reached for the adoption of such a scheme, but it appears certain that any plan for airship development which the Government may decide upon will take the form of a service of airships operating on a civilian basis on the route to the East. In any event, it should be realised that whatever plan may be decided upon the construction of the first airship of commercial type would occupy a year or longer, and probably two more years would elapse before a regular service was instituted.

In the initial stages of such a scheme the airship line should, like the cross-Channel aeroplane lines we have already discussed, be considered as an additional link in a chain which comprises all forms of communication. Co-operation with shipping will be as necessary to the airship line as co-operation with the railway is to the aeroplane lines.

Similarly, co-operation between the airship and the aeroplane will also be a necessity. It will be a natural function of the aeroplane to act as a fast collector and distributor for the airship. For example, when the journey from England to Perth, Australia, is flown in eleven days, a passenger, having gained so much valuable time, will demand equally rapid facilities for completing his journey over the comparatively short route between the airship base and his final destination. Thus the two classes of aircraft will be complementary to one another, each carrying out the function for which it is most suitable from an economic point of view.

SOME ASPECTS OF AIRSHIP OPERATION

Future development of the large rigid airship will be more cautious than was possible under the conditions of war. The accidents to these craft which have occurred during the past few years may be regarded as the penalty of over-accelerating development and taking exceptional risks as a matter of war necessity.

Every one of the airships which has met disaster was of a war type, specially designed for lightness to attain the maximum height for war purposes. Airships for commercial operation will be built for long distance and speed, and height will not be an important factor. There is no doubt that these airships will be strong enough to fly with safety through any weather that is likely to be encountered.

The safety of an airship of adequate structural strength was demonstrated by the experience of "R. 34" on her trans-Atlantic flight. This airship, although a war design, was of comparatively heavy construction. On her outward trip, while crossing the Bay of Fundy, the vessel passed through a severe electrical storm, with violent air "bumps" which lifted up the vessel several hundred feet at a time. The ship suffered not the slightest damage from this severe test.

Furthermore, since 1919 great strides have been made on the theoretical side of airship design, embodying all the practical experience gained in the past. To assure this, a committee, including the best brains in the country, was formed to study all aspects of the question.

The introduction of the mooring mast revolutionised the whole position of airship operation. Before the system of mooring to a mast was developed the utility of airship transport was limited by the necessity of housing the airships in sheds. A party of 300 or more men was required to handle an airship into or out of her shed and this operation could only take place in favourable wind conditions. Thus, although an airship could stand up to bad weather whilst in the air, airship flying was always dependent on a suitable wind prevailing at the time of starting and landing and on the maintenance of a large landing party.

Those handicaps have been entirely removed by the mooring mast. Experiments have been carried to a successful conclusion, proving that an airship suitably constructed can land or depart from a mooring mast in winds of any strength likely to be met with, can ride safely at the mast through the heaviest weather, and can be refuelled and repaired while at the mast. The practical results of this on the organisation of an airship line are far-reaching: the regularity of airship flying will be subject to no more interruption by the weather than is the case with a steamship. Only at terminals will expensive sheds and layouts be required. Intermediary landing grounds will be equipped with a mooring mast and small running repair facilities at comparatively small cost. When at terminals, airships will remain at the mooring mast between journeys; and since only serious repairs and general overhauling will be carried out in the shed it is possible to consider an airship shed in the same relationship as a graving dock to a steamship.

Among other technical improvements now available which will greatly increase the safety of airships is the substitution of heavy oil fuel for petrol. This heavy or crude oil has a high flash point and its use will practically remove any danger from fire.

Another improvement of high commercial value is the burning of the waste hydrogen as fuel, in combination with the liquid fuel, thus reducing running costs and increasing freight carrying capacity.

The Germans, after the Armistice, in spite of the unsettled state of their country, had sufficient confidence in the commercial possibilities of airships to construct two vessels and operate them on the route Berlin-Munich-Friedrichshafen (Lake Constance). With the "Bodensee" they flew every day from June to October, 1919, maintaining a high degree of regularity. This service was closed down, as these ships were handed over to France and Italy under the terms of the Peace Treaty.

A point that is not sufficiently understood concerning airships is that their relatively short life is compensated for by the greater amount of work they are capable of doing in a given time as compared with steamships.

For example, it is calculated that an airship flying on the route from England to Bombay would make at least twenty return trips per annum, whereas a steamship makes only eight return trips. The airship would cost £175,000 and carry 200 passengers; the fast liners cost £700,000 and carries 600 passengers. From these figures it is easy to see that in a life of six years an airship would do as much useful work as the steamship would do in a life of fifteen years. Further, the capital cost per passenger carried would actually be *lower*, and the annual depreciation charge per passenger carried would also be lower. These figures for the airship are conservative rather than optimistic, but nevertheless they remain estimates, the truth of which has not yet been put to the test.

The airship, therefore, provided it can run at a profit, satisfies an urgent requirement—a requirement that cannot be filled by any other form of transport—and offers to the British Empire a new instrument of progress that will, if it is given the public support it deserves, revolutionise the commercial and political outlook of the whole Empire.

CONCLUSION

The mainstay of the Empire is the existence of close co-operation between its members, and this co-operation depends to a great extent upon the methods that are adopted to make the Empire self-contained economically. Great Britain must, as a primary duty, ensure that adequate facilities are provided to enable a greater part of her trade to be carried on within the Empire, and so be less dependent on foreign markets. The weakness is that the present facilities for fast communication are inadequate.

Once the speeding up of communications is an accomplished fact an increase in trade will certainly follow, and the Empire will become more and more self-supporting and be able to take a more independent position, unfettered by the economic conditions of other countries, which at present have a grave influence on our trading position.

It must not be forgotten, however, that the public are slow to realise the importance of new inventions and to adapt themselves to changed conditions. This happened in the case of the train and steamship. Progress was slow; the public had to be educated at each step; mistakes were made and had to be rectified; experience had to be bought. Nevertheless, these two means of transport persevered and to them are due the expansion and development of the Empire up to the position she holds to-day.

The conservatism of the public is, however, one of the greatest obstacles that air transport has to overcome, and it is necessary to emphasise again the fact that this new method of transport can only be put into a condition of practical utility on a self-supporting basis as the result of a determined effort on the part of the public to employ air transport whenever they can in order that it may have a fair opportunity to prove its worth.

CHAPTER XV

OVERSEAS MAILS BY AIR AND SHIP

The State requires that its mail steamer should not only be fast in relation to other ships on the route, but that it should sail or delay its sailing to suit the mails—keep a programme settled months in advance even if men strike or trade changes—and keep space empty for all the mail matter that may be sent to it. All this costs money, but by describing the payment for these services as a mail subsidy the State sometimes misleads itself and the public into the belief that it pays the mail-carrying steamer more than its service is worth. On the great trade routes British " mail subsidies " are not intended by the State or understood by the ship-owner to exceed an appropriate charge for the services rendered.

If the mail subsidies were withdrawn altogether from steamers on these routes the shipping companies would lose a fraction of their business, but they would also be relieved from heavy expense and commitment.

If it becomes possible to transport by air for the whole journey those mails and passengers to which and to whom speed is of supreme importance, the speed of the mail steamers will become of less importance, but until the whole bulk of the mail goes by air a regular mail-steamer service will still be required. The bulk of the mail is made up of commercial documents of title to cargo shipped in cargo steamers, and trade requires that these documents which cannot be made up till the cargo vessel clears shall arrive at destination before the cargo.

Commerce, therefore, needs a mail service faster—but not much faster—than the cargo services; but excessive speed or frequency of mail steamers would do little, if anything, to help business. The cable will always be faster than any mail steamer.

It might appear that these requirements for the carriage of commercial documents involve the use of more commercial mail steamers, but the cargo services are directly related to the trade, and when trade expands more passengers are ready to pay the fares of faster mail steamers. When, therefore, business men are left to settle, without the interference of politicians or local patriotism, the speed and frequency of a service, it by no means follows that ship-owners are disinclined to build new and fast steamers or to drive them at full speed.

It is not generally attractive to ship-owners to be tempted away from a commercial service and to be led to build vessels superior to the requirements of trade because a State has money to spend on a special subsidy. Such expensive steamers are hostages given to fortune, as the ship-owner may find to his cost when his contract expires.

On the great trade routes the withdrawal of the mail subsidy would reduce the frequency and regularity of despatch of fast passenger steamers rather than the quality of the steamers themselves; ship-owners would continue to build the best and most expensive steamers that their trade could afford, but they would not run these steamers when trade did not require them.

On routes of minor importance a different policy is sometimes followed and the State gives a definite subsidy in order to maintain a mail service superior to the needs of trade. If the mail subsidy were reduced or taken away on these routes the passenger service would decline in speed, frequency, and cost till it reached the level which the trade could afford.

In considering what would happen to steamer services if mails were sent by air it is necessary always to remember this distinction between the mail services which are commercial and those which in the strict sense of the word are "subsidised." The commercial services might actually be improved if the air route improved communication and stimulated trade, and the non-commercial services might be wiped out.

If the air service could only convey part of the mails, or only for part of the journey—as, for example, part of the Eastern and Australian mail to Egypt—the steamer service would still be required and its cost would not be materially reduced. The State would have to pay for the air service as an extra, but the transit of mails would be improved.

If it proved possible to deliver mails by air in Egypt in two days from England, the transit of mails from England to India would be faster than any rail and steamer service could offer even if expense were of no account. It is almost certain, therefore, that if air services are efficient they will be the means of express delivery.

So much for the air route for mails.

If the air competed for passengers its influence on steamer services would be much more serious. The result of this competition would depend on an unknown factor—the relative efficiency of the air and steamer services. It is probable that in its early years the air service overseas would carry only that small fraction of the passengers to whom time is more important than comfort, cost, and risk. The air and sea services would be complementary to each other rather than competitive. Directly the air service became safe and comfortable its competition would determine the quality of the steamer services. If an air voyage to Australia took a week against four weeks by train and steamer—and cost twice as much—with a minimum of risk to passengers, the air would divert from the sea many of the best-paying passengers for whom fast steamers are primarily built, and the tendency would be for the ship-owner to cater for the less wealthy passengers for whom comfort at a low cost is more attractive than speed. On this assumption, competition by air would degrade the quality of the steamer services, and would produce vessels with lower or certainly of no higher speed than at present. This tendency would govern the policy of ship-owners so long as the volume of trade remained constant, but it seems probable that the effective competition by the air, which brought Australia within a week's journey of Europe, would enormously increase the traffic to Australia, and that while the fast and expensive travel went by air, there would remain for the sea a traffic in excess of the whole traffic to-day.

The growth of the traffic would counteract the harmful effect of air competition, and it might even follow from effective competition in the air that ship-owners would, in their own interests, put better and faster vessels on the ocean.

This mutual encouragement given by the air and sea to one another would continue to improve the service until one route definitely mastered the other. If, for example, the air line maintained its superiority in speed and, at the same time, brought down its costs and risks to the passenger to the level of the sea, practically every one would travel by air and the passenger steamers would cease to run.

As a ship-owner I may be permitted to hope that even this conclusive result would not crush the seamen ship-owners and investors of the British Mercantile Marine, who would grow wings and launch new ships aloft.

A. G. ANDERSON.

CHAPTER XVI

COMMUNICATIONS BY CABLE

PERHAPS no single development of our Western civilisation during the last half century has done more for the world than the submarine cable.

To-day it is accepted as an integral part of everyday life without question, and without much thought. Yet the cable has a wonderful story behind it, rich in disappointment, rich in difficulties overcome, and rich in that peculiar quality of the British which we sum up in the simple word " grit."

To grit we owe the cables, and to the cables we owe in no small measure our existing world development.

Side by side with the successful introduction of the telegraph, it was perhaps natural that men should turn their minds to the idea of a submarine cable. Morse proclaimed his faith in it, and in 1840, and again in 1842, experimented with a wire, insulated with tarred hemp and rubber, in New York Harbour. He was successful in sending messages through it. Wheatstone performed a similar experiment in Swansea Bay. But what did for short distances was not adaptable for long. The difficulty was to prevent the electricity from leaking into the water. India-rubber had been tried as long before as 1811 by a Russian electrician, who succeeded in firing a mine by means of a wire so covered ; but rubber was not easy to deal with in those far-off days. Faraday and Wheatstone, however, were successful in utilising it, and in 1850 the first submarine cable was laid across the Channel. It was simply a copper wire coated with gutta-percha. The day after it was laid a Boulogne fisherman caught it in his trawl, and in his ignorance, cut a piece out of it under the impression that he had discovered some new seaweed with a " heart of gold." That misfortune caused the projectors to sheath their next cable with hemp and iron wires, and the cable was laid on November 13, 1851. In the following year Great Britain and Ireland were similarly linked, and in May, 1853, a further cable connecting England and Holland was laid.

But the great feat was to come. Successful in short distances, it was quite another problem to lay a cable from the British Isles across the stormy Atlantic to America. Yet the scheme—by some called mad—was attempted. Failure succeeded failure. In 1858 success was achieved. Messages were exchanged between Queen Victoria and President Buchanan through the wire, and the completion of the work was hailed as a triumph on both sides of the Atlantic. But the success was short lived. After working for a few weeks, the insulation failed and messages could no longer be sent. Yet the projectors did not lose heart, and at once started to lay plans for another attempt. In the meantime matters were developing in the Mediterranean. Long-distance cables were successfully submerged there and in the Red Sea. The Government appointed a Committee of Experts (1859) and published the findings in a Blue Book.

Interested in the 1857 venture was Mr. John Pender, a successful City merchant in the textile business. He was among the 345 contributors who had each put up £1000. Undeterred, he continued to support the cable enterprise. Then came the failure of the *Great Eastern*, in 1865, to lay the Atlantic cable, and most people considered the feat impossible. Not so Mr. Pender, and it was due to his personal guarantee of a quarter of a million sterling that the cable was made and successfully laid by the *Great Eastern* in the following year. That was not the only service Mr. (afterwards Sir John) Pender rendered to the world. In 1872 he dealt with the finances of the various cable concerns running through the Mediterranean, and amalgamated them under one control, thus giving birth to the Eastern Telegraph Company and its associates in the great primary British cable group. When Sir John died, towards the end of the last century, so successful had he been that his companies controlled 73,640 miles of cable, with a capital of £15,000,000.

In 1922, Sir John Denison Pender, who succeeded his father in the control of the Eastern system, was able at the Jubilee celebrations of the Company to say that in 1869 there were only 8000 nautical miles of submarine cables, against 325,000 to-day. The capital invested half a century ago was two million sterling compared with fifty millions of private capital to-day, nearly half of which is represented by the undertakings comprising the Eastern Associated Telegraph Companies.

That group, which may be described as the great British system, is comprised of the following companies :—

The Eastern Telegraph Co., Ltd.
The Eastern and South African Telegraph Co., Ltd.
The Eastern Extension Australasia and China Telegraph Co., Ltd.
The Western Telegraph Co., Ltd.
The West African Telegraph Co., Ltd.
The African Direct Telegraph Co., Ltd.
The Europe and Azores Telegraph Co., Ltd.
The River Plate Telegraph Co., Ltd.
The Pacific and European Telegraph Co., Ltd.
The West Coast of America Telegraph Co., Ltd.
The Direct Spanish Cable Co., Ltd.

The mere names disclose a far-flung system of enormous importance. But a glance at a cable map of the world will show how world-wide are the facilities offered by " Via Eastern."

The red lines, indicating the cables, encircle Spain and traverse the Mediterranean and the Red Sea. They link up Egypt, India and Ceylon, and run through the Malay Straits, go north to China, and south to Australia and New Zealand. They completely surround Africa, and, via the Cape, provide alternative routes to India and China, Australia and New Zealand. They cross the Atlantic, through the Azores to South America, running down the

South American coasts and, crossing the Continent, link far-off Chili and Peru with London; while from Barbadoes there is a new line to Miami which provides communication between the Northern and Southern portions of the great Western Hemisphere. It is, in short, an enormous system. Moreover, development is continuous.

It has truly been said that the War services of the cables will never be fully realised. That is certainly not an overstatement. Had British communications been cut at the outset by the enemy, much time would have been lost before instructions could have been conveyed for the dispatch of Overseas contingents; and the War might very easily have had another termination. While our own cables were intact—the nerves which enabled the brain in London to act with complete freedom—the enemy had a completely different story to tell. Within four hours of the declaration of war, Germany was entirely deprived of direct cable communication with the United States, and, soon after, with the outside world as a whole. That is another story which concerns the cable-ships and their doings—doings which were highly dangerous, but to the enemy dangerously efficient. Suffice it to say that the German Channel lines were diverted to British and French uses, and helped to play their part in a system of communication which did marvellous things for Britain and her Empire during the hour of trial.

In only two cases were the Germans able to interrupt our cables, and then only for short periods. The *Emden* succeeded in cutting the cable at Cocos, but not before the staff of the Eastern Extension Company had got through a message which spelt the doom of the German ship.

Now a word as to wireless. In all cases of new inventions the public are apt to think and speak a little wildly. When electricity commenced to compete with gas, the masses readily jumped to the conclusion that gas was soon to be a thing of the past. Gas was doomed, and the gas companies ruined. The cable itself in the old days was to supplant the mail; broadcasting is to kill the musical concert. As a matter of actual fact none of these things happen. More often than not the mere threat of competition puts new life into those who manage and control established undertakings, and the old and the new method run along together, each in the sphere to which it is best adapted.

Since the War there has been tremendous development in the methods of cable working, and in the electrical apparatus used. Automatic relays have entirely superseded manual re-transmission between cable sections. This is not in any sense a technical article—indeed all technicalities have been carefully avoided—but perhaps in a non-technical article for the general reader it may be said that magnifiers or amplifiers have for some time past been in use which render signals more definite, and enable the carrying capacity of the longer cables to be increased. The Eastern and Associated Telegraph Companies' cable system is now equipped with automatic apparatus at all its main line stations. By this means, telegrams, after being prepared for transmission at the original forwarding stations are automatically relayed through various transmitting stations to their destinations. Telegrams from this country are punched up in London and the signals automatically reproduced at stations *en route* without the intervention of the human element. Direct communication is thus afforded between London and all the important points of the Companies' vast system. For example, the signals which are sent from London are reproduced at Wellington (New Zealand) by means of automatic apparatus, a distance of approximately 18,500 nautical miles.

The installation of these automatic instruments has enabled the Companies to cope with greatly augmented traffics with promptitude. The development has increased transmitting speeds and, at the same time, reduced the number of errors to a minimum. Since the introduction of automatic working, it has been found that the number of repetitions requested by the public has been considerably reduced.

Here, for instance, are some figures showing the speed at which the cables work. They relate to the Derby of 1923. The result of that race was known in the places named within the following times :—

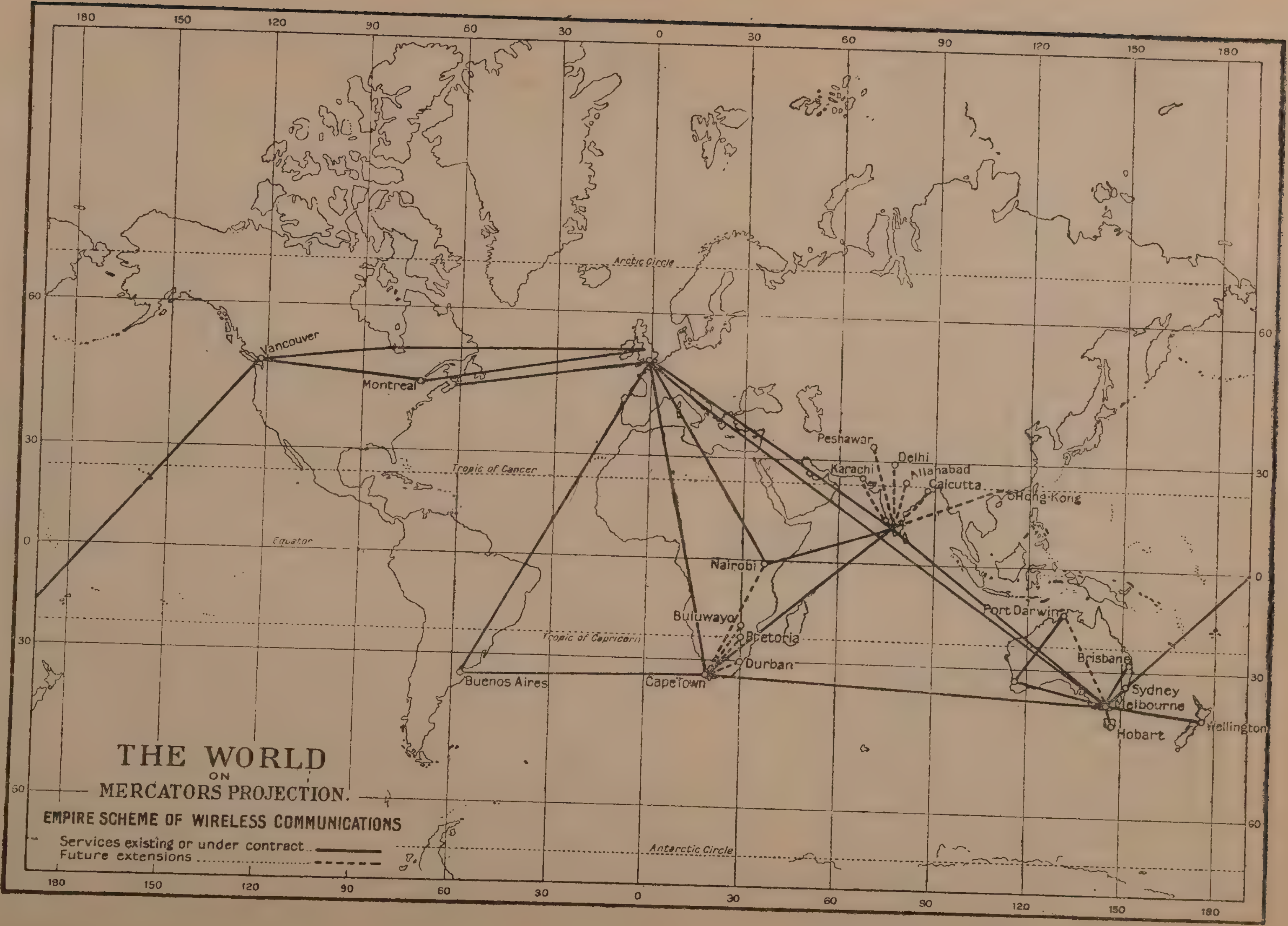
Cape Town . .	½ a minute.	Bombay . .	1½ minutes.
Cairo . . .	½ "	Singapore . .	1½ "
Para and Lima .	½ "	Hong-Kong . .	2 "
Melbourne . .	1½ minutes.	Shanghai . .	2½ "
Sydney . .	1½ "	Calcutta . .	4½ "

The speed speaks for itself.

Another matter of some importance is the introduction of what the Americans have termed "wired wireless." To explain this in non-technical language is rather difficult. It may, however, be stated roughly that by means of the system any station on a cable route is enabled to communicate with another station by this method without in any way interrupting the flow of the direct messages. Direct communication between England and Australia may therefore be transmitted while inter-station messages are being sent. Here, again, the cable has been able to increase its load and achieve economy in working. Indeed, it is not putting it too high to say that the development of the capacity of the cable has by no means ceased, for the brains of the experts are constantly turned towards efficiency. The research departments are in daily session.

Since the War, too, there has been a change in the habit of the cabling public. During hostilities, code messages were prohibited. Nothing but plain word messages were permitted. The damage to trade was enormous. Lines were congested. But the part played by the cables in the business life of the community was demonstrated to the full. There was a keen anxiety to get back to code; but the singular result has been that cable users are reverting, where possible, to plain word messages! It has been found that coding and decoding, with its liability to error, is almost as expensive as the use of plain words. Again, there is a growing demand for such a service as will enable private messages to be more freely sent. This in essence is a demand for reduced cost; and the cable companies have responded with facilities at such rates that the public, as apart from commercial and financial interests, are using the cables to a greater extent than ever. The introduction of the Daily Letter Telegram by the Eastern Associated Telegraph Companies has proved extremely popular. These special letter telegrams must be written in plain language. They are accepted for transmission on any day except Sunday and are delivered normally after 48 hours from the time they are handed in. The charge in principle is one-quarter of the ordinary rate subject to a minimum charge for twenty words. In this way India, Burma, and Ceylon have been brought within the reach of the slenderest purse, a minimum message costing only 8s. 4d., with an additional charge of 5d. for each additional word. Australia and Tasmania in similar fashion costs 15s.; New Zealand, 13s. 4d.; and South Africa, 10s.

This is but an instance of how cables are serving the public, knitting the Empire, and developing trade. Indeed, it is not an exaggeration to say that few things have contributed so much in the past to the place Britain holds in the world's commercial economy than her belief in cables, the foresight of her cable pioneers, and her enterprise in developing them.



THE WORLD
ON
MERCATORS PROJECTION.

EMPIRE SCHEME OF WIRELESS COMMUNICATIONS

CHAPTER XVII

COMMUNICATIONS BY WIRELESS TELEGRAPHY

Communications imply facilities for the interchange of intelligence as well as for the conveyance of passengers and merchandise. Any new invention which materially increases the facilities of either of these two broad classes of communication must, if properly developed, play an important part in the progress of civilisation. Although it is in connection with the interchange of intelligence that the art of wireless has had in the past, and is likely to have in the future, the greatest field of development, nevertheless its influence in increasing the safety of marine navigation must be regarded as one of first-class importance in improving the facilities for the conveyance of passengers and merchandise.

The importance of wireless can be measured firstly, by the extent to which it offers a solution to the problem of communication between points where other means of communication are impossible or impracticable; secondly, by the extent to which it may supplement and widen existing channels of communication.

If the subject of wireless telegraphy and telephony is approached from this point of view and some of the fundamental characteristics of the science are examined, the conclusion must inevitably be reached that its importance can scarcely be exaggerated and that the invention owed to the genius of Guglielmo Marconi will be chronicled by future historians as one of the milestones in the progress of mankind. Though much has already been accomplished in providing services which a few years ago were unthought of and which have added substantially to the trading facilities of the world, we are as yet only on the fringe of possibilities, the benefits of which, when realised, will be felt more and more as the art and applications of wireless develop.

The main point of difference between wireless systems and the older methods of telegraph and telephone communication by land wires and cables, lies in the conductive agent employed to convey the signals. While the latter makes use of narrow artificial channels in the form of insulated conductors which have to be constructed, laid, and maintained between the various points of communication, the former utilises a medium, namely, the ether, which is provided by Nature and which permeates the universe.

In both land and wireless systems of communication, the ultimate objective is identical, namely, to produce at the receiving end certain impressions which can be translated either into written characters or into intelligible sounds. For the purpose of communicating written characters, only two kinds of impression need be produced, namely, a short and a long mark, usually known as the dots and dashes of the Morse code. For the purpose of communicating articulate speech, the impressions produced must vary in frequency, pitch, and character between very wide limits in exact sympathy with the air vibrations created by the voice.

But although in both systems the ultimate objective is identical, the fundamental difference in the characters of the conveying agents necessitates entirely different methods of transmission and reception and gives to each system certain advantages which the other does not possess.

Although wireless is likely to have a marked influence on the development and extension of the cable and land-line system in the future and may even in some cases supersede the latter, both systems are essential if we are to obtain full advantage of the implements of communication which science has placed at our disposal. The introduction of the motor-car has not resulted in the scrapping of the tram lines. Nevertheless, it is an indisputable fact that had the motor-car never been invented, the tramway systems would have been developed to a greater extent than has actually been the case. But what is far more important is that the additional facilities offered by motor transport have enormously increased the trading capacity of the world, thereby creating a still greater demand for transport facilities of all kinds.

In the same way the introduction and perfection of wireless telegraphy and telephony have not resulted in, and are not likely to result in, the scrapping of the land line networks and cable systems of the world. But while it will undoubtedly influence the future extension of the cable system, by far the most important effect it will have will be to increase the trading facilities of the world.

What, then, are the principal advantages which can be claimed for wireless, and what are the immediate scientific developments which are likely to increase and extend its general application? These are questions which must be answered if the possibilities of this new means of communication are to be grasped.

In the first place, wireless makes use of a medium which permeates every part of the world; all points on the globe are already linked together and it is only necessary to establish the requisite apparatus at any number of points to enable communication to be established between them. As a result, communication can be established with equal facility between fixed land stations, with ships moving on the ocean or with aeroplanes in the air. Moreover, wireless can span intervening countries and the open ocean without the possibility of malicious interruption at the hands of hostile nations or tribes.

With cables and land wires, on the other hand, the possibility of communication is restricted to a number of fixed points between which an artificial link, in the form of an insulated land line or cable, must be laid and maintained. In some cases the construction of such a link is impossible as, for example, between ships and between aeroplanes or from ship to shore or aeroplane to the ground. In other cases, although it is possible, the question of maintaining it in efficient order presents peculiar difficulty. For instance, in tropical countries covered with dense vegetation, the land lines are likely to be broken by the fall of trees or short-circuited by contact with creepers which rapidly climb the supporting posts and become intertwined with the insulated wires, causing serious leakage and breakage of the conductors, especially in wet weather. Again, in colder countries, the weight of ice and snow which settles on the wires not only severs the conductors but will sometimes destroy thousands of the supporting poles, completely interrupting communications for long periods while the damage is being repaired. Submarine cables are also subject to the destructive forces of Nature. Tides and currents cause the cables to chafe on rocky projections and destroy their insulation and sometimes submarine earthquakes will sever the cable. In war time these artificial lines are exposed to the attack of the enemy, and even a brief and temporary command of the oceans might be sufficient to enable the enemy to cut all communications between England and the rest of the Empire which would take weeks or even months to re-establish.

Again, wireless permits of direct telephone and telegraph communication being carried out over distances hitherto unattained. The reason for this is not at first sight apparent. Briefly, it may be said that owing to the perfectly elastic character of the ether, the impressions radiated from the transmitter are not appreciably distorted between the communicating points and consequently, with suitable apparatus at the receiving end, they can be intercepted without any loss of intelligibility. In the case of the transmission of written characters by the Morse code, the effect of distortion does not make communication impossible, but limits the speed of transmission, thereby limiting the traffic-carrying capacity of the circuit. The distortionless character of the carrier agent of wireless communication permits, therefore, of telephonic communication over unlimited distances and enables extremely high speeds to be obtained in telegraphic communication.

An aspect of wireless which has troubled the minds of the public, perhaps unduly, is the question of secrecy or privacy. So much has been said regarding this subject that it has assumed a significance out of all proportion to its true importance. Few realise how simple it is to interrupt or tap the telephone or telegraph messages which are continually being conveyed along the wires which border our highways. There are, however, two factors which make it extremely unprofitable to attempt to do so. Firstly, it is a punishable offence; and, secondly, it is highly improbable that any useful information could be obtained by doing so. Probably the latter is the main reason that there are very few cases on record in which it has been found that the land lines have been tampered with.

The same argument applies to the tapping of wireless messages. One station alone may handle thousands of messages a day, many of them in code, and it is hardly conceivable that it would pay anyone to receive and decode all these messages on the off-chance of finding something of value. Further, in this case the difficulties of the would-be interrupter are multiplied by the fact that most of the important commercial traffic is handled by automatic high-speed transmitting apparatus, which requires costly apparatus and highly technical skill for its reception.

But apart from the unlikelihood of wireless traffic being deliberately intercepted by unauthorised persons, a method of transmission has been invented and is being developed by the Marconi Company which will have the effect of making it practically impossible for anyone to receive intelligible signals, even with suitable apparatus, unless they are in possession of certain key information by which to synchronise their reception. The immediate object of this method of transmission is to increase the traffic-carrying capacity of a given installation, but the fact that it will also obtain secrecy is of particular interest in this connection.

So far as telegraphic traffic is concerned, we may therefore regard privacy, in the sense of its insusceptibility to interception, as being of secondary importance when due regard is paid to the circumstances in which the traffic is handled. But these considerations cannot be said to apply in the same degree to private telephone conversations. For this latter class of communication, the land-wire system has several fundamental advantages over wireless, not only as regards privacy, but also as regards its amenability to control. With a land-wire system, the control of the lines of communication is entirely centralised in the hands of the exchange operator, and if the line is engaged a subscriber has to wait his turn and is powerless to interfere with the proper regulation of the traffic. With a wireless telephone system, on the other hand, the control of the communications would be distributed amongst the various subscribers. For this reason alone, and quite apart from any other limitations, such as the cost of apparatus and technical maintenance, any organisation of a private wireless telephone company on a large scale appears practically impossible. Except in sparsely populated districts or in cases where the land line is impracticable, the wireless telephone as a means of house to house intercommunication is not likely to have a serious field of development.

But as a supplement to the land-wire network, wireless telephony is destined to occupy a very important position by acting as a link or trunk line between central exchanges, especially where these latter are separated by oceans or by wild intractable country. In such cases the wireless apparatus will be erected at any suitable site within reasonable distance of the telephone exchange and connected to the exchange by an underground or overhead line. The exchange operator will connect up the subscriber to the wireless in precisely the same manner that he would connect him to a trunk line for a long-distance call. In this way the disadvantages referred to previously would be entirely overcome, as the wireless link would be controlled entirely by the staff of the telephone system. Moreover, the question of privacy would not arise, as the other subscribers' land-line instruments would not respond to the wireless transmission unless connected to the wireless circuit through the exchange.

The really important side of the question of privacy is not how to prevent unauthorised people from listening-in, but how to prevent one message or one service from interfering with another. To take an example, suppose two conversations were to be carried out simultaneously on a common trunk line, a condition which is sometimes met with in practice due to mistakes at the telephone exchange or to unbalanced land-line conditions. When such conditions exist, the effect is to make it difficult, if not impossible, to carry on a coherent conversation as the several voices get mixed up and interfere with one another.

In wireless, every one uses a common medium, and, therefore, unless we have some means of discrimination either at the transmitting end or at the receiving end or at both, the simultaneous use of several neighbouring stations would become more or less impracticable. For this reason, the progress of wireless has depended, more than on any other factor, upon the development of methods and apparatus by which signals emanating from the required source could be filtered and selected to the exclusion of all others. There are three principal methods by which this can be achieved, viz.:—

(1) Utilisation of the principles of resonance by which a receiver can be made to respond only to one particular frequency or wave length.

(2) Directional reception by which a receiving system will only respond to signals coming from a predetermined direction.

(3) Directional transmission by which a transmitter will only project the waves in a definite direction.

Although the requisites needed to achieve these methods were, from the start, well within the possibilities of discovery, an enormous amount of scientific research work had to be carried out before a sufficient degree of perfection could be reached to bring them within the grasp of commercial utility. Great credit must be given in this connection to Senatore Marconi and his band of co-workers for their untiring efforts in the face of many failures, as a result of whose work, that which a short time ago was regarded by most as the dream of visionaries, has become a commercial reality.

As would be expected, the rate of progress in the development of wireless increased as the data accumulated and as the science and technique of the art advanced. With perhaps one exception, it is difficult to point out any individual discovery or factor which has pre-eminently influenced the course of development.

The exceptional development we refer to was the discovery by Dr. Fleming that an electrical current could be conducted through a vacuum by means of electrons emitted from a heated filament. The first result of this discovery was the invention of what is known generally as the "Fleming valve." The new discovery bore the germ of far-reaching possibilities and resulted in the invention of the Thermionic Relay or three-electrode valve. As a magnifier of ultra-feeble oscillatory currents, the thermionic valve has not only extended the working range of communication many times but what is even more important, it has enabled methods of reception to be employed which increase the selectivity of the receiver both from a directional and tuning point of view. As a magnifier capable of dealing with powerful currents, the thermionic valve enables high-frequency current of perfect uniformity to be generated for the purposes of transmission, thereby permitting the extreme selectivity of modern receiving apparatus to be utilised to the utmost advantage. It also enables these powerful high-frequency currents to be controlled by the feeble impressions of sound acting through a microphone, thereby making possible the transmission of sound from powerful wireless transmitters.

Equipped with a greater knowledge of the nature of the forces with which they are dealing, engineers have rapidly developed the art of controlling these forces. By increasing the efficiency and power of the transmitter and by perfecting methods of selective reception, long-distance telegraphy by wireless has already been brought to a stage of perfection comparable with that of a cable. Moreover, wireless has spread its influences in quarters hitherto untouched and for which its characteristics are peculiarly suitable. Every ship of any size carries wireless apparatus with which she can keep in communication with the shore and with other ships up to distances of 2000 miles or more, enabling shipowners to communicate their instructions to a captain, passengers to keep in touch with their business houses or friends, and ships in distress to call for help. Methods of navigation have been converted from what was in some circumstances largely intelligent guesswork to an accurate science by means of the wireless direction-finder. Lightships are in direct communication with their headquarter offices. Time signals and information regarding meteorological conditions are broadcast for the information of anyone who cares to make use of it. Musical programmes and educational lectures are broadcast to millions daily. These are only a few of the benefits which wireless in its present stage of development has brought to mankind.

All this, and more, has been accomplished up to the present—but what of the immediate future ?

In an earlier paragraph referring to the factor which must chiefly influence the progress of wireless, we mentioned that there are three principal methods by which simultaneous communication without mutual interference can be carried out by wireless, namely :

(1) By tuning to a particular wave length.
(2) By directionally selective reception.
(3) By directional transmission.

Until recently only the first two of these lines of development have been exploited, and although the theoretical possibility of making use of directional transmission has for a long time been realised, a practical solution of the problem of ways and means of doing it on a commercial scale had not been found.

As recently as last year, however, under the personal direction of Senatore Marconi, experiments have been made with a view to applying the principle of the beam transmitter to long-distance telegraph and telephone working, which had been previously originated by him and developed by Mr. Franklin, of the Marconi Company, for very short wave and small-power working.

With ordinary methods of transmission, the radiation from the aerial is equally distributed in all directions and gradually fades away according to the law of inverse squares, as the distance from the starting-point increases. To compensate for the attenuation thus affected, and also for the absorption of energy by obstructions in the path of communication, the power of the transmitter has to be increased in proportion to the square of the distance to be spanned, and actually powers of 100 to 500 kw. are employed to carry the trans-Atlantic traffic between America and Europe. If the energy which is at present distributed over the whole of the 360° of the compass is concentrated in a beam covering an angle of say 5°, then only 1/72nd part of the total energy is required to produce the same intensity of effect at the distant receiver. Thus a 10 kw. beam of 5° will produce the same effect at a distance as a 720 kw. transmitter radiating in all directions. During the tests carried out by Senatore Marconi in 1923, signals of commercial intensity sufficient to permit of high-speed automatic working were received at distances of 2,250 nautical miles using only 1 kw. of power at the transmitting station. Since then the Marconi Company has designed transmitting apparatus employing waves under 100 metres capable of dealing on this principle with powers of 50 kw., which gives some indication of the wonderful possibilities of this system.

The importance of this development can hardly be exaggerated and will be better appreciated by summing up in Senatore Marconi's own words the advantages which are the direct outcome of his invention.

> Firstly, owing to the better utilisation and concentration of power, a much smaller amount of electrical energy need be employed for a given distance, resulting in substantial economy in capital and in working expenses.
>
> Secondly, reception is confined to stations within a certain restricted angle or sector, and this increases the privacy and secrecy of communication, besides greatly reducing the possibility of mutual interference between stations.
>
> Thirdly, owing to the employment of comparatively short waves, the speed of transmission and reception can be several times greater than is attainable with existing long-distance systems.
>
> Fourthly, the disturbances caused by the effects of atmospheric electricity are greatly minimised.

Evidently the immediate future holds much in store for the development of wireless. Unfortunately the commercial development of long-distance wireless telegraphy in this country has been seriously hampered by events which have prevented commercial companies from extending their system on a world-wide scale, whilst the Government has also held its hand. It is not proposed to enter into a discussion on the merits of the controversy which has occupied a very prominent position in the Press of the Empire for some time past, but it is urged that either the Government should act promptly or it should remove the restrictions on the companies.[1]

The full advantages of a wireless system can only be achieved if several stations can be controlled and operated to meet the exigencies of a varying traffic and that the value of the system as a whole increases with every additional transmitter installed. The reason for this is that in the event of there being exceptional pressure upon one transmitter, any of the others which may be available at the moment may be utilised to relieve the pressure. Further, the chief difficulties which wireless encounters are atmospheric. They may at times temporarily interfere with the direct communication between two distant parts of the Empire. Organised control of a number of stations may make it easy to meet this by using a longer alternative route, relaying the message.

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[1] This went to press before the publication of the "Donald" Committee's Report, to which those interested are referred. Cmd. 2060.

THE IMPERIAL CHAIN

The scheme put forward by Marconi Company for an Imperial wireless chain gives a concrete idea of the way in which the problem of Empire wireless communication might be handled. This may best be gathered from a study of the accompanying map. It will be seen that the high-powered trunk stations were to be situated in Great Britain, at Montreal and Vancouver, at Cape Town, at Melbourne, and in India. The stations in Great Britain would, in the first instance, conduct commercial services with all the Dominions, with the United States of America, Argentina, Brazil and other South American countries, and with China and Japan. Vancouver was to be in direct communication with the East and with Australia. Cape Town would conduct services with South America, Southern India, and Australia; and Melbourne would not only communicate directly with Great Britain and Vancouver but also with South Africa and India.

Subsidiary to the Imperial chain was the scheme for the establishment of " feeder " stations, which would carry wireless facilities into the remoter parts of the Dominions and Colonies.

In Australasia, for instance, there were to be station sat Perth, Port Darwin, Brisbane, Sydney, Hobart, and Wellington, in addition to Melbourne. These would not only provide services of wireless telegraphy between the States of the Commonwealth but they would enable residents in any of the States to send wireless messages to other parts of the world via Melbourne. Important parts in the northern part of India would similarly be linked by wireless services with the high-powered stations in Southern India, and this plan was to be carried out throughout the Empire.

In Australia the work is being carried out by Amalgamated Wireless (Australasia) Limited, a company in which the Commonwealth hold half the shares plus one.[1]

CONDUCT OF A WIRELESS TELEGRAPH SERVICE

The Marconi wireless transmitting stations in Great Britain are situated at Carnarvon in North Wales and at Ongar in Essex, and are automatically operated from the Marconi telegraph office in London. Messages are prepared for high-speed automatic transmission by means of a perforator with a typewriter keyboard. The tape is fed through a high-speed transmitter, which automatically operates the wireless signalling apparatus at Carnarvon or at Ongar. Wireless waves travel through the ether at a speed of 186,200 miles per second. The actual passage of a signal between far-distant stations therefore occupies but a fraction of a second, and the operation of the receiving apparatus in the distant country is practically simultaneous with that of the transmitting plant in London. The fact that no human agency intervenes between the operator at either end minimises the chances of delay or error in transmission.

The receiving station at Brentwood, Essex, is automatically linked with the central control office in London, where the receiving instruments are installed. Incoming messages appear as perforations on a paper tape, which is made to operate apparatus that transforms the signals into Roman characters, and prints them on another continuous paper tape. This tape is gummed in suitable lengths to a form, and the message is delivered to the addressee in one of three ways—by telephone, by private telegraph line, or by messenger.

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[1] For a summary of the position in the Dominions and India, see Cmd. 2060, pp. 1–2.

WIRELESS FOR ISOLATED PLACES

Although the completed Imperial wireless chain and the subsidiary system of stations will cover the Empire with a network of wireless communications which will touch every important centre of population and commerce, it will still leave the more remote parts of the Empire without a telegraph service. For the benefit of those who live in isolated places comparatively low-powered wireless installations, for both telegraphy and telephony, are available. At the present time, for instance, a system of wireless telegraphy is being established in North-West Australia and in the Northern Territory, where it will put scattered homesteads in touch with the outlying towns, and through them with populous cities. Wireless telephony is being employed to a considerable extent in India, where schemes are in course of preparation to develop a network of wireless stations covering the several States. Many of the ruling princes have interested themselves in the advancement of wireless communications, and possess cars fitted for telephony.

In 1922 the Marconi Company demonstrated the possibility of providing a telephonic service between England and Holland. Wireless stations, each connected to a trunk telephone line, were established at Southwold and Zandvoort, 115 miles apart; these provided a wireless link between the English and Dutch telephone systems, and speech was exchanged between London and Amsterdam.

With the introduction of "Beam" transmission such services are likely to be developed on a commercial scale in the near future.

WIRELESS FOR LIGHTSHIPS

Wireless telephone apparatus had been installed on a number of lightships around the coasts of Great Britain, and has shown that it possesses marked advantages over the older system. Skilled operators are not necessary for the manipulation of a telephone set, and the cost of working is therefore considerably less than when telegraph apparatus is used. Moreover, the captain of the lightship has no longer to rely upon the services of an intermediary, but can speak personally to the officers at the dock office, thereby saving time, which is often a valuable factor in the case of lightships which are responsible for life saving. Groups of lightships are based upon one land station. At the southern entrance to the Thames, for instance, there are the Tongue lightship, the North, East, and South Goodwins, and the Gull lightship, which all have Ramsgate for their base. In Ramsgate Post Office there is a wireless call bell, an apparatus which has been devised to obviate the necessity for some one to be constantly listening at the receiver. In the event of a vessel being in danger near any of the lightships, the news is telephoned to the shore, and the nearest life-boat is sent to her assistance. Parkestone and Harwich are also the centres for groups of lightships, and Liverpool Dock Office is in telephonic touch with the Bar lightship in the River Mersey. This seems a case where wireless may definitely supersede the existing cable communications between lightships and the shore, which are a continual source of trouble.

WIRELESS AND AVIATION

All British commercial aeroplanes flying regularly on organised air routes now carry Marconi apparatus, which can be used by the pilot or engine mechanic. Wireless stations have been established at the principal aerodromes on the air routes, and pilots are constantly in telephonic touch with them for the purpose of reporting their positions and receiving information as to weather conditions. Ranges reaching 400 miles, and even more than that distance, have been attained by telephony between aircraft and ground stations.

An important feature of the wireless service for aeroplanes is the wireless direction finder, which is an indispensable aid to the pilot when poor visibility renders air navigation a dangerous hazard. Other uses of wireless in connection with aviation have been described in an earlier chapter.

BROADCASTING

The broadcasting of news and entertainments by wireless has done much to popularise the science in Great Britain, where an elementary knowledge of its principles is possessed by many thousands of people of all classes. There are in Great Britain eight Broadcasting Stations, besides relay stations, and regular daily programmes are transmitted, including concerts, lectures, and addresses, and a summary of the day's news. On several occasions important speeches, delivered in public, have been broadcast throughout the country. The first notable example of this was the broadcasting of the address delivered by Sir Ernest Rutherford as President of the British Association for the Advancement of Science, in 1923. Sir Ernest spoke at Liverpool, and his address was transmitted by land-line to several wireless stations, and thence broadcast to anybody possessing a suitable receiving set. Apparatus for the reception of broadcasting ranges from simple crystal sets to multi-valve instruments; some type of apparatus is therefore within the reach of everybody's means, and broadcasting is proving not only a popular form of entertainment, but a valuable social force. In this connection it is interesting to note that the development of broadcasting is being keenly watched by educationists, who see in it a force which may become of great value to them in their work. The transmission of short lectures by leading authorities, on a variety of subjects, which is a regular feature of the programmes at most British stations, has proved to be popular with the public. The result is a great extension of general information; and, when a series of lectures on one subject is broadcast, such as the course on English history which has been delivered at the London station, they cease to be merely informative, and acquire a definitely educational value. The constant transmission of good music may do much to improve the musical taste of the public. Mention may also be made of the series of talks by leading industrialists describing British industry, which were arranged in co-operation with the Federation of British Industries.

TIME SIGNALS AND WEATHER REPORTS

Wireless time signals are of particular use at sea, where they enable navigators to set their chronometers to standard Greenwich mean time at least once a day. They are transmitted at certain definite hours from a very large number of wireless stations throughout the world. The transmission is in most instances carried out automatically by means of a device which is set in motion by the pendulum of a standard clock.

Meteorological information is also regularly broadcast from certain wireless stations for the purposes of navigation. In some cases reports relating to conditions obtaining at individual stations are transmitted to ships; in others, reports as to conditions prevailing over a comparatively large area are obtained from several stations, and collated to form a " Synoptic data message." From this a weather forecast is drawn. A special storm warning is sent out when the forecast implies weather conditions which are likely to endanger shipping, and the presence of icebergs is also notified to ships.

In Great Britain, weather reports and forecasts compiled by the Air Ministry are broadcast daily by telephony from the stations of the British Broadcasting Company, not only for general interest, but especially for the information of those who are engaged in agriculture. The extension of broadcasting to the Colonies will bring this benefit to agriculturists throughout the Empire.

WIRELESS AT SEA

Wireless telegraphy is now used at sea for three separate and distinct reasons. Firstly, as an addition to other measures which can be taken to increase the safety of life at sea; secondly, as an assistance to navigation; thirdly, for the purpose of conveying messages between ships or between ships and the land.

Its value from the point of view of safety of life at sea is very great indeed. The use of wireless telegraphy allows ships to know one another's approximate position if they are anywhere near one another, and if disaster does overtake any ship it enables her to summon assistance and guide the rescuing ship towards the scene of the disaster.

As an aid to navigation it enables messages to be passed to ships informing them of the state of the weather and probable future changes. It also allows the exact time to be signalled over great distances, thus enabling ships to check the accuracy of their chronometers. This information is of paramount importance when determining the longitude of a ship at sea. Also certain modern wireless instruments, called direction finders, allow a ship to determine for herself the exact direction of any other ship or coast station which may be transmitting a message by wireless telegraphy. These observations can be made with considerable accuracy, an analysis of the achieved results showing that errors exceeding two degrees are rare—less than 10 per cent of the whole number recorded.

Thirdly, the wireless apparatus is used for transmission and reception of messages. The range over which ships can communicate with one another, or with the shore, depends to a great extent on the apparatus with which they are fitted and the size of the vessel. Large liners can keep up a regular communication among themselves or with the shore at distances up to 1,500 miles.

In order that messages may reach their destination with the least delay, an elaborate system of intercommunication between ships is in use. Charts are prepared and circulated called " Communication Charts," which show at a glance the probable approximate position of the big liners for some time ahead.

By these means small ships know what big ships are likely to be within wireless range of them and which way they are going, and thus messages are forwarded, if necessary by wireless repetition or sometimes in the form of a letter which is transcribed in the big ship and posted on her arrival in harbour.

THE " WIRELESS LIGHTHOUSE "

A further development in the use of wireless for maritime purposes has been the erection on Inchkeith Island, in the Firth of Forth, of an installation which transmits a rotating wireless " beam." This signals a different Morse letter to every two points of the compass. The beam transmitter works in conjunction with a special receiver which is fitted to a ship ; the navigator knows that the transmitter lies in the direction represented by that letter. Other transmitters of improved design are in course of erection at points where they are needed, and as this system of " Wireless lighthouses " is developed it will to an increasing extent supplement existing means of rendering the coastal waters safe for navigation.

CHAPTER XVIII

IMPERIAL POLICY IN COMMUNICATIONS

The various means of communication, which play their part in binding the British Empire together, are broadly divisible into two groups. To the first group belong those means which render a local service and are primarily the concern of the individual country, be it Great Britain, India, a Dominion, or a Colony. In this category fall railways, roads, inland waterways and the internal telegraph and telephone systems. To the second group belong those means of communication which are directly used to link up the units which form the Empire, and enable trade and intercourse to be successfully carried on between them. In this category are found the ocean-going vessels, airships, cables, and wireless. Imperial policy is only indirectly concerned with the former, whilst with the latter the concern is not merely very direct, but, in many matters, the questions that arise are more than Imperial, they are international.

So far as the railways, roads, and other internal means of communication are concerned, whilst the method and extent of the development must be left to each area to decide for itself, the Empire as a whole is concerned with two aspects of the development. In the first place it is important that the development be adequate, otherwise the resources of the Empire will not merely not be developed to their full capacity, but the failure of the one part may affect other parts vitally. Cotton may be taken as a commodity which it is a matter of urgency should be more widely produced within the Empire. Certain areas are recognised as likely to prove suitable for the growing of cotton on a large scale. Any failure to provide adequate means of communication for such areas means not only a local loss, but a loss to those parts of the Empire where cotton manufactures are carried on, and which are feeling a shortage in the supply of the raw material. British Guiana may be mentioned as a colony which is reported to offer opportunities for successful cotton cultivation, but where no appreciable progress is likely to be made until improvements are made in the means of transport.

It is also a matter of concern to manufacturers how the developments are effected. Motor-cars built for high-class roads may prove very unsuitable for rough roads. Railway material may vary in its standards so as to give advantage to the foreign manufacturer. Further, the variations may make supplies more difficult to obtain in time of war or other emergency. It is only necessary to look at the railway-gauge problem in Australia to realise how much loss may occur in the absence of a unifying influence.

There is one other respect in which these means of internal communication have an Imperial aspect. Ships only link the sea-boards together. They are dependent upon the inland means of transport for the collection of the cargo at the beginning of a voyage, and for its distribution at the destination. Without their aid ships would have to be small and so a much less cheap means of transport. In other words, the economic size of the ship is largely governed by the size of the cargoes which can be rapidly collected and distributed, and this depends not merely on the port facilities but on the capacity of the inland transport undertakings. Local in their essence the means of inland communications may be, but they act and react on the means of communication, which furnish more directly Imperial problems.

The second group of Empire means of communication supply innumerable problems, which involve two or more units of the Empire, and which every one must desire should be solved without friction. Many of them are quite beyond the capacity of those who organise the means of transport to solve. The ship-owners' liability under bills of lading is an excellent example. Whatever agreement ship-owners might come to amongst themselves or with the shippers, effect could only be given to such agreement by legislation on the part of the principal individual units of the Empire. It illustrates also another phase. The ship-owners' liability is not merely an Imperial but also an international question. If in the settlement the Empire is to bring its full weight to bear, there must be no uncomposed differences between Great Britain, India, and the Overseas Dominions. A united front is essential.

Shipping has furnished the first instance of a truly Imperial Committee, sitting with great regularity, and continuously studying and dealing with the problems connected therewith from an Imperial standpoint. An excellent account of the work done by that committee was given by its chairman, Sir Halford Mackinder, to the Imperial Economic Conference on the 17th October, 1923.[1] Its work has ranged over Bills of Lading, Deferred Rebates, Freight Rates on particular routes, Port Charges, Assessment of Shipping to Income-Tax, Deepening of Harbours, etc. Throughout its reports and decisions have been unanimous, and it has earned the goodwill of shippers and ship-owners alike. With absolute unanimity the representatives of India, the Dominions and the Colonies bore witness to the excellence of the work that had been done in the three years of its existence, and resolutions in appreciation of it as "of the highest importance to the Empire," and recommending its continuance were passed. This has since been arranged, and it is undoubted that Governments, ship-owners, and shippers are all glad that the excellent work done by the Committee under its able chairman will go on without interruption.

The remarkable success achieved by the Committee may be traced to several causes. First may be mentioned the personnel. The ablest men interested have willingly given their services even though the meetings for most of each year have been as frequent as once a week. Only men of first-rate ability could have produced the results. Then the Committee has always achieved unanimity. Not once has there been an opportunity for an opponent or a critic to make capital out of a minority report. To these may be added that the Committee was not merely itself only an advisory body, but it had no compulsory powers enabling it to summon witnesses, and call for books and documents. Whether it got the necessary information in any case depended on whether it could win goodwill and inspire such confidence that the particulars would be freely given. It had therefore to depend upon the goodwill that it could create. Compulsory powers would most probably have increased the distrust with which it was viewed at its inauguration. The Imperial Shipping Committee may well be looked upon as a type of organisation which may prove of great value to the Empire in co-ordinating the activities of the different units, wherever co-ordination is necessary or desirable.

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[1] *Vide* Imperial Economic Conference Proceedings, pp. 293–309. Cmd. 2009.

For some years it has been recognised that shipping and railways hold out little prospect of assisting to bring the parts of the Empire nearer together by reducing the journey-times. For a time the huge ship was thought to offer possibilities, but the cost of the high speeds have been found to be out of all proportion to the gain in time. Moreover, the difficulties of obtaining the rapid turn-round at the ports, which is so necessary for economy, have proved very great. Railways have hardly improved their train running speeds in the last thirty years. Air transport seems to hold out hopes of supplying the necessary speeding up. Aircraft will ultimately be able to follow the shortest routes regardless of sea or land below, and travel at speeds hitherto unknown. The degree of reliability already obtained is remarkable, and there is no reason to doubt that in a few more years transport by air will equal transport by sea or rail for reliability and safety.

For long-distance flight the air-ship is looked to as likely to provide the greatest commercial utility. The organisation of air-ship services on the main Imperial routes would most certainly create a demand for local services by aircraft, as after performing the greater distances at the high speeds of air travel, there would be rebellion against the remaining portion of the journey for passengers and mails being carried out by a slower means of travel, if the distance were at all considerable. Unnecessary duplication of overhead charges can only be avoided, and the utmost economy in the organisation and operation of aircraft services for the purposes of Imperial commerce can only be obtained, provided there is an effective co-ordination of effort. Such co-ordination must not in any way interfere with that freedom of action which is essential to meet local conditions. It may, however, assist progress in the immediate future, and save much waste through expenditure being incurred locally without due regard to future Overseas services. Further, the view is expressed in a memorandum prepared by the Air Ministry that "such co-ordination cannot be fully achieved without co-operation for utilisation of Imperial equipment within the Empire."

In addition to the purely Imperial problems, there are international problems involved in air transport. The shortest Imperial routes involve flying over foreign countries. Tentative rules for controlling flying have been agreed with other nations, but, as air transport increases, the problems will become more and more complex. When these rules come under discussion the British Empire should, as far as possible, speak with a single voice. This is not only in the interest of the Empire, but in all probability what is best for our widespread Empire will also be best for the world.

It is doubtful whether in the present stage of development as simple machinery will serve to co-ordinate air transport as has proved so effective with shipping. In addition to an Imperial air transport committee, a technical engineering committee may be both desirable and necessary. Whatever experts and statesmen may decide is the best form for the co-ordinating machinery to take, there can be no two views on the desirability of it being set up and tested as soon as possible.

The need for co-ordination is not less when the Imperial communications by cable and wireless are looked at. Wireless is the more urgent. Not merely is it the newer and less well-established means of communication, but there is the necessity of distributing the limited number of wave lengths which the Empire can get allotted to the best advantage. Moreover, the progress of invention in the science is being so rapid that only a permanent body sitting at frequent intervals can keep pace with it, and without such a body there would be a great danger that Imperial policy would lag behind. There has been an Imperial Communications Committee in existence for some time advising mainly on questions relating to cables and wireless. The Committee was, however, a departmental committee without any representation of India, the Dominions, or the Colonies. The Imperial Economic Conference adopted a resolution which makes the necessary enlargement of the Committee, so that it is now not merely a committee dealing with Imperial communications, but is also in fact an Imperial Committee.

There are good reasons for hoping that we are now on the right road for dealing with the communications of the Empire from an Imperial standpoint. From air transport there are hopes of the improvement in rapidity of transport which is so essential to the Empire. Co-ordinated effort should help to eliminate waste, and so contribute materially to rendering transport cheap and effective. Wireless presents possibilities of assisting communication in the same direction. Not that the older-established means of transport and communication will be superseded, but new and old, if properly developed, will alike contribute to the development of our Empire resources to just the extent that each shall prove itself the economic means of communication.

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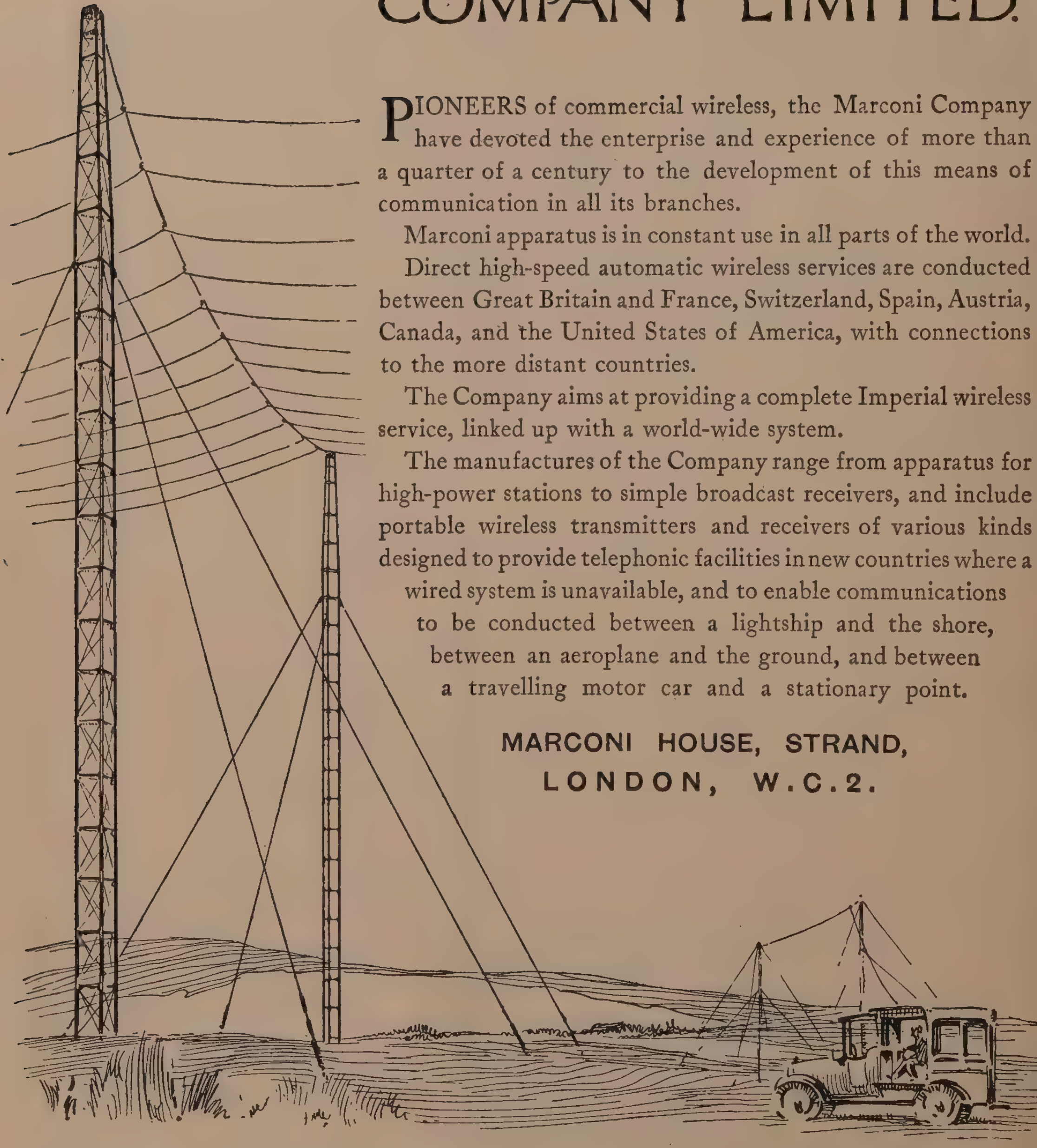

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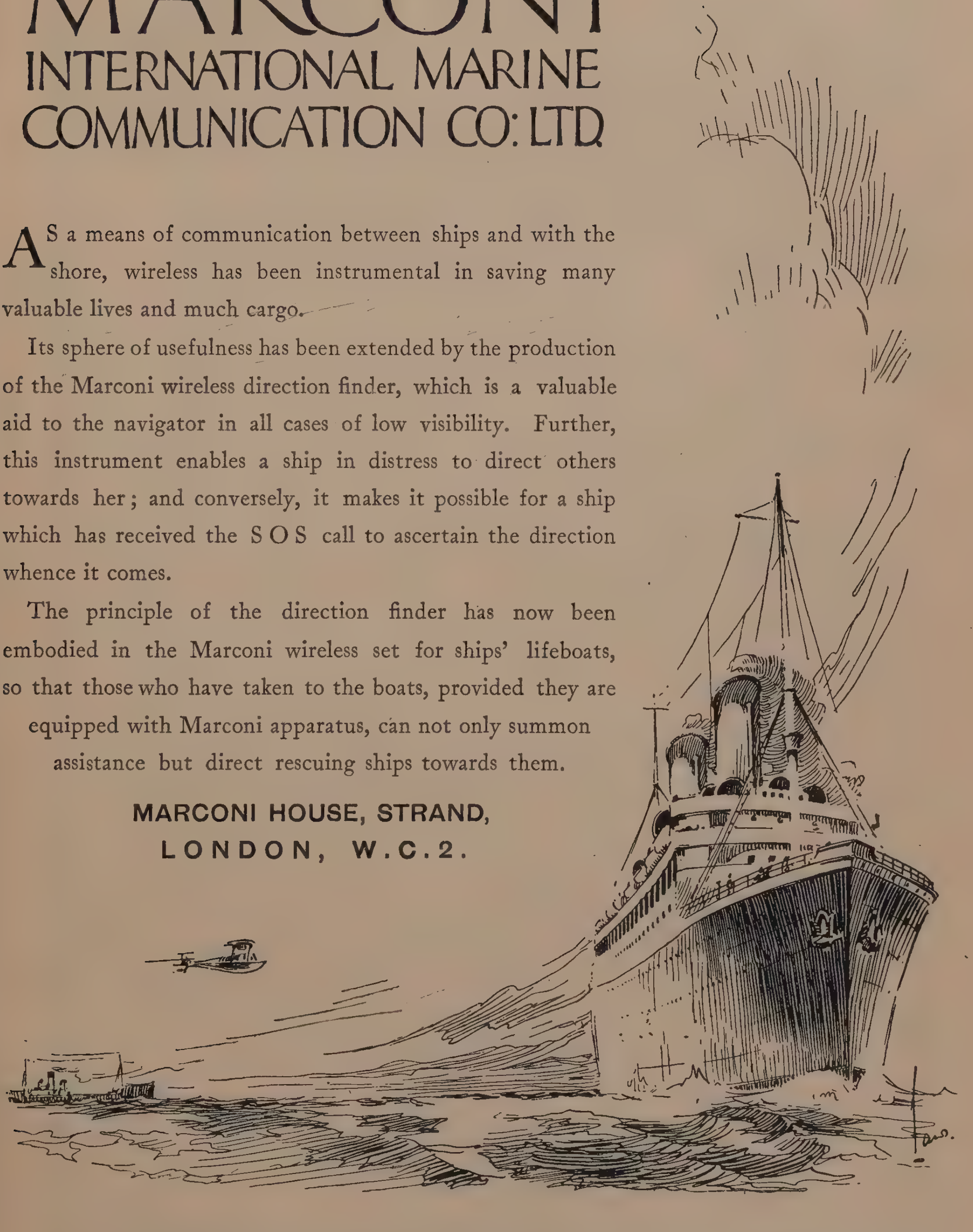

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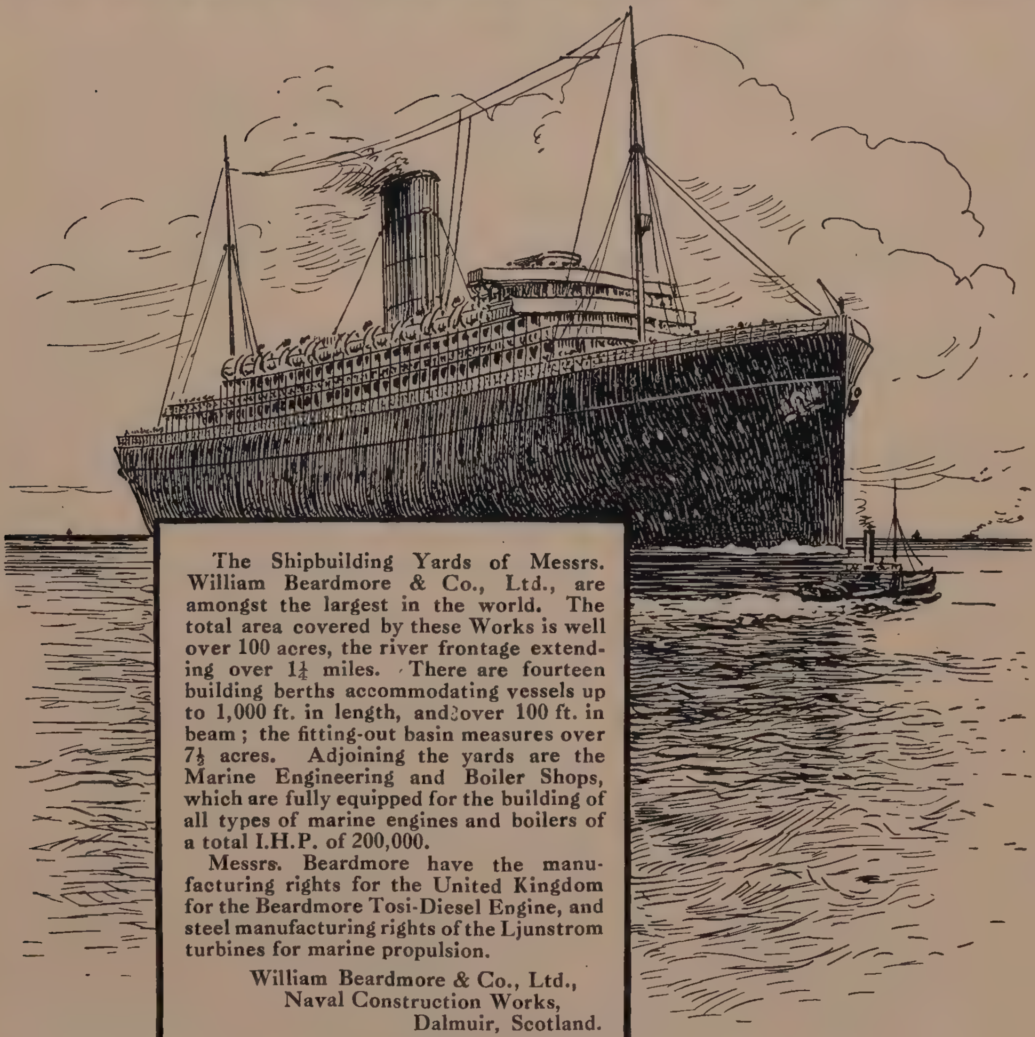

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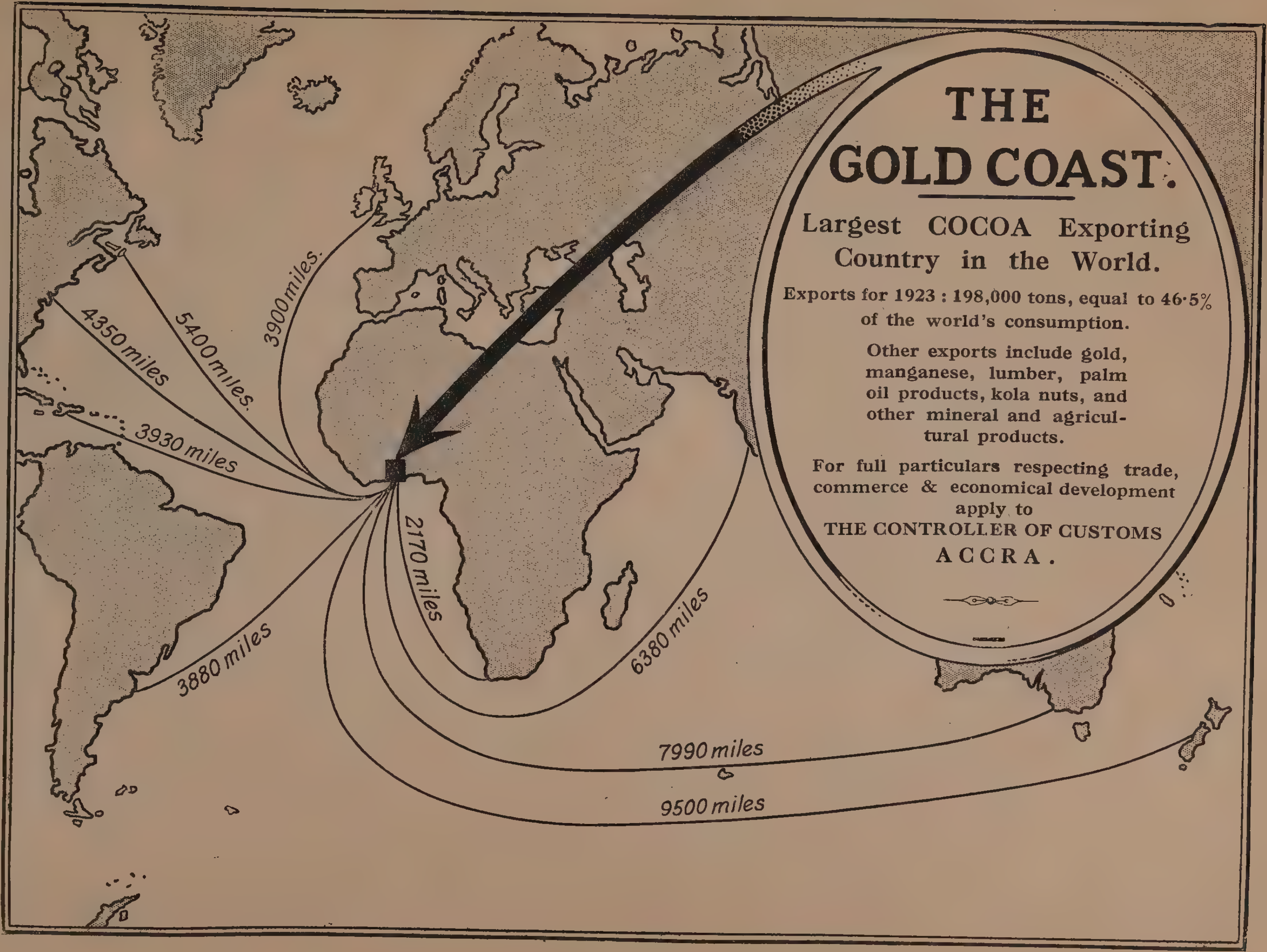

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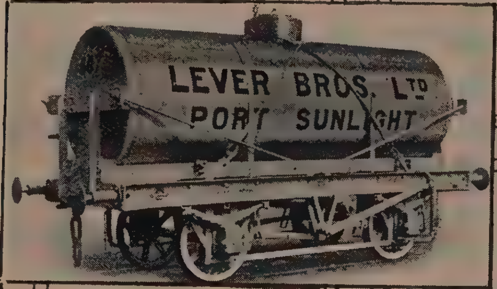

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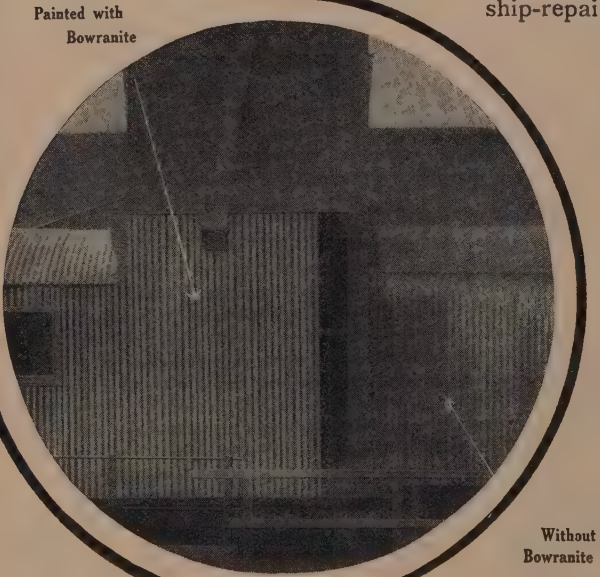

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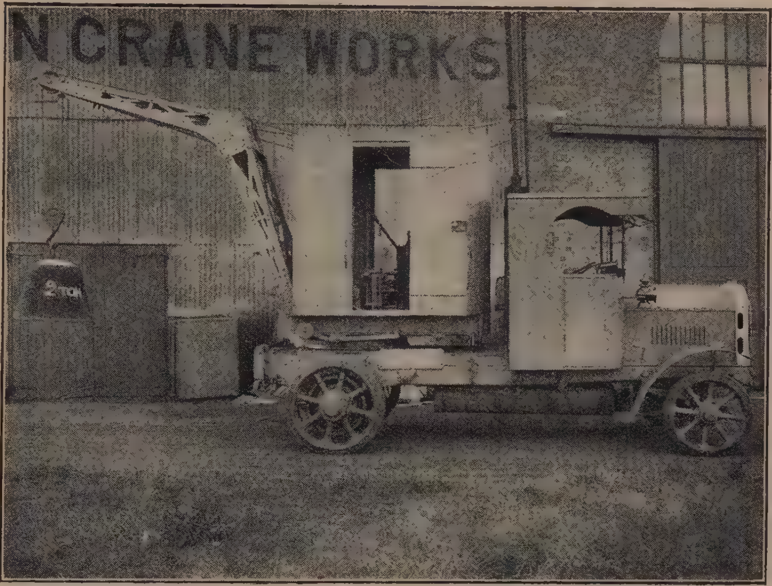

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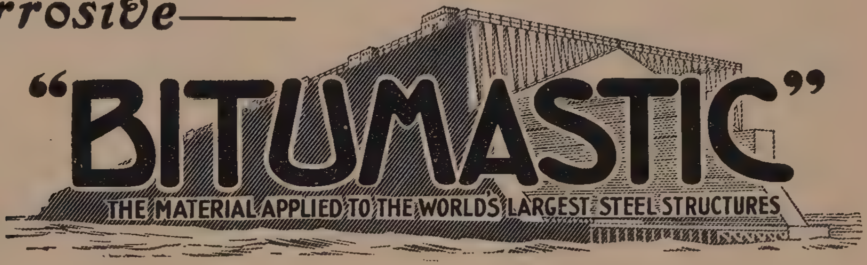
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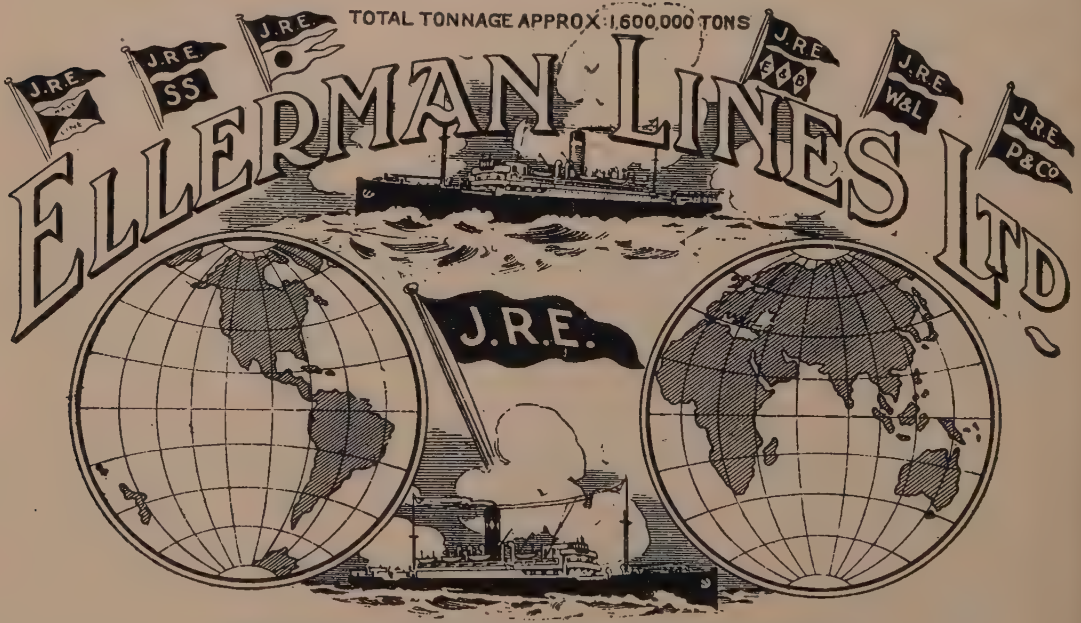

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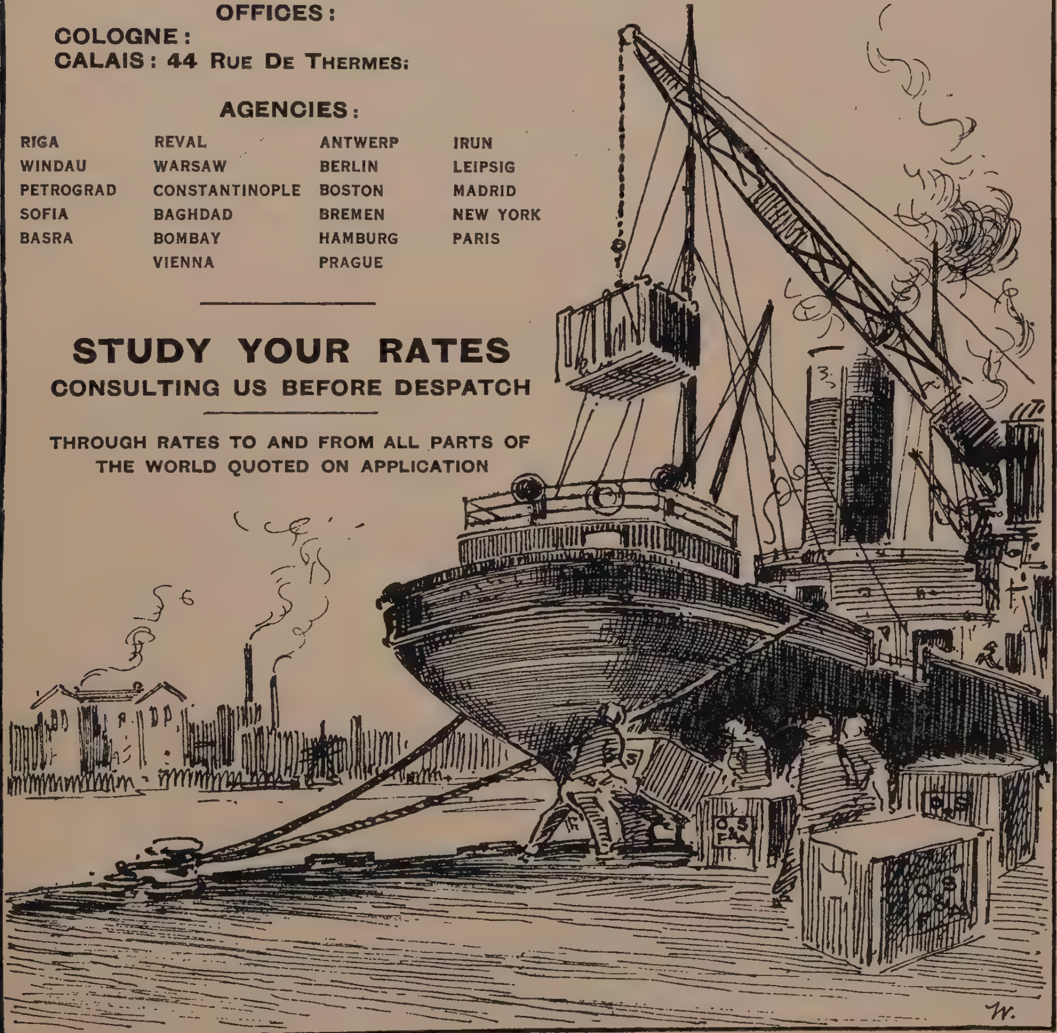
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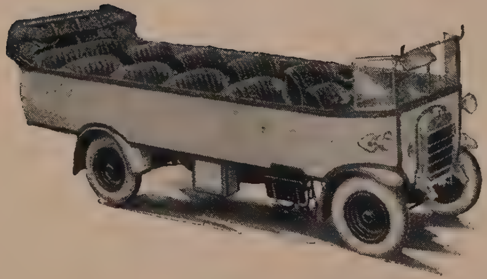

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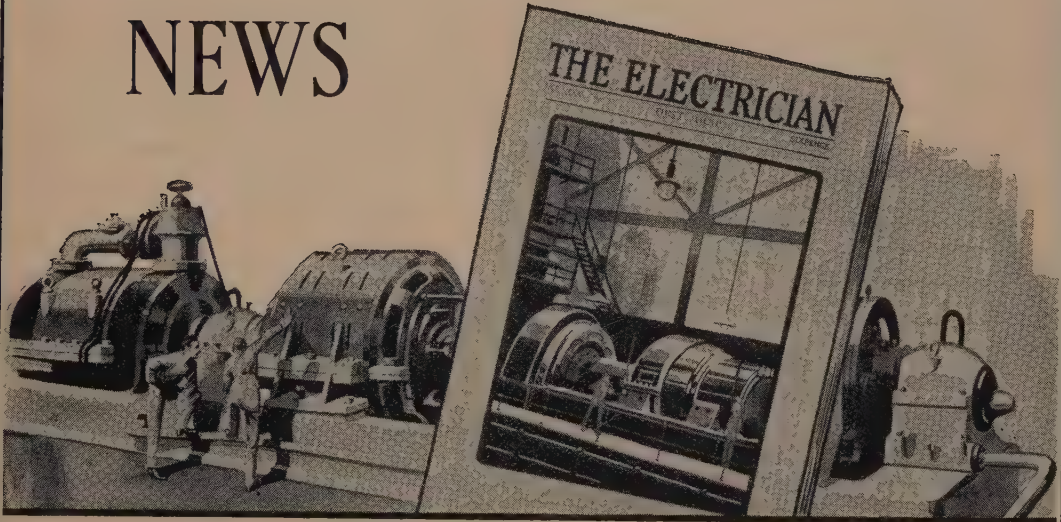

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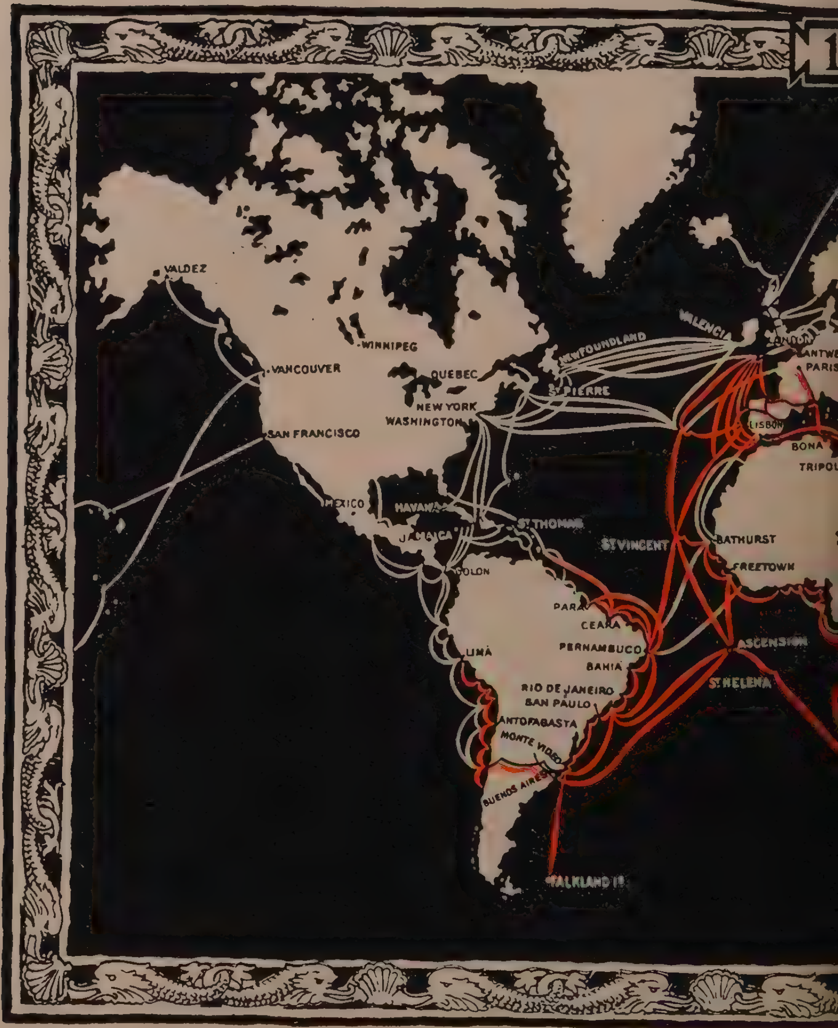

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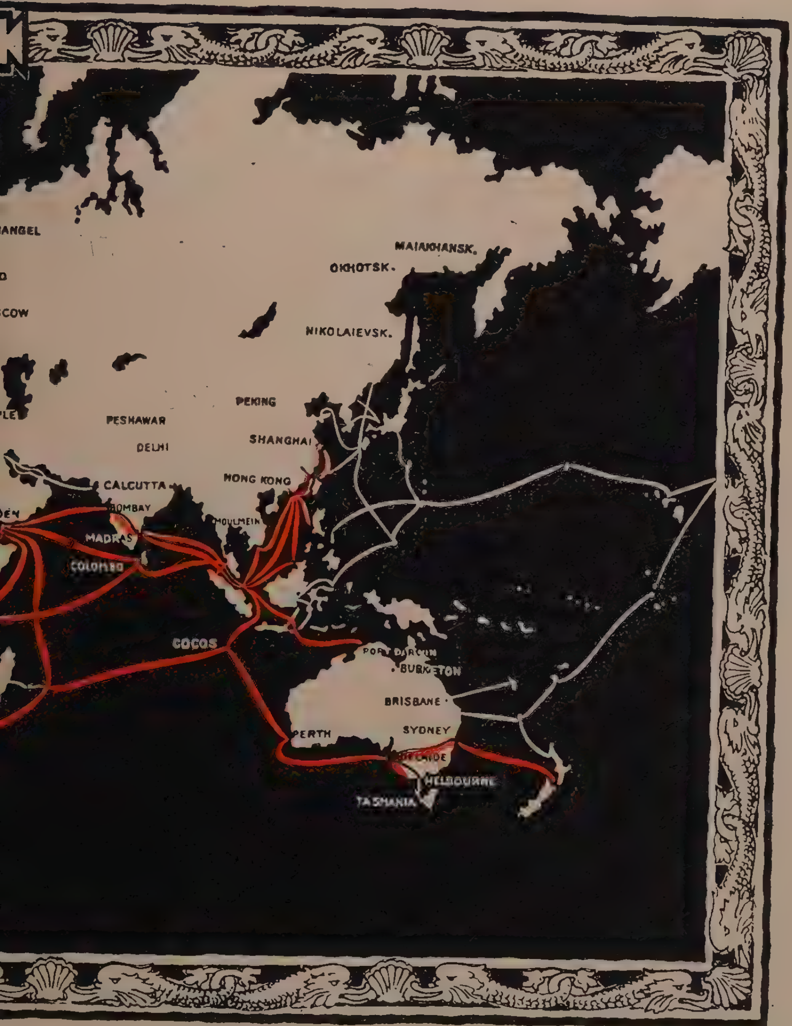

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